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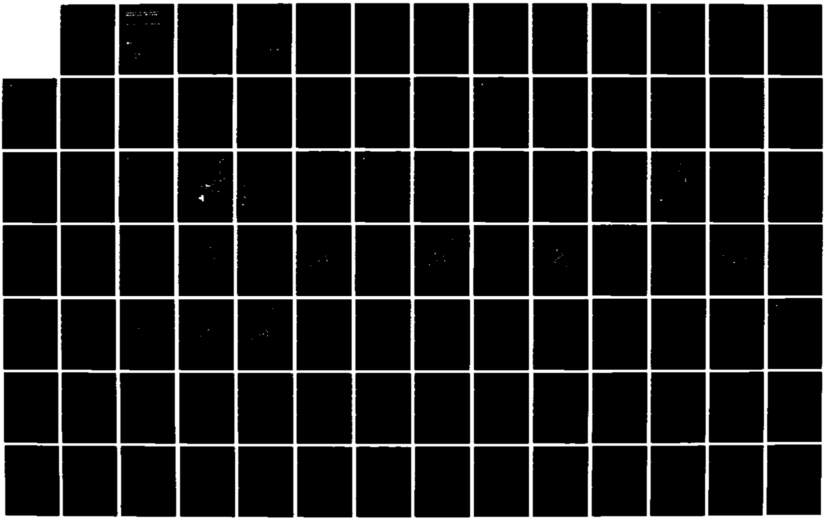

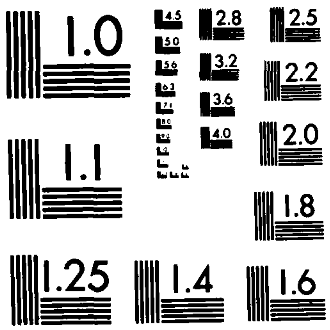

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

For McChord Air Force Base, Washington

CH2M HILL

Prepared for

R FORCE ENGINEERING AND SERVICES CENTER
RECTORATE OF ENVIRONMENTAL PLANNING
NDALL AIR FORCE BASE, FLORIDA 32403
ID
ILITARY AIRLIFT COMMAND
RECTORATE OF ENGINEERING AND ENVIRONMENTAL PLANNING
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JGUST 1982

NOTICE

This report has been prepared for the United States Air Force by CH2M HILL SOUTHEAST, INC., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, or the Department of Defense.

INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

For

MCCHORD AIR FORCE BASE, WASHINGTON

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

and

MILITARY AIRLIFT COMMAND
DIRECTORATE OF ENGINEERING AND ENVIRONMENTAL PLANNING
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By

CH2M HILL
Gainesville, Florida

August 1982

Contract No. F08637 80 G0010 0014

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ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ABG	Air Base Group
ADC	Air Defense Command
ADS	Air Defense Squadron
AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
AFFF	Aqueous Film Forming Foam
AGE	Aerospace Ground Equipment
AIM	Air Interceptor Missile
AMS	Avionics Maintenance Squadron
APS	Aerial Port Squadron
AVGAS	Aviation gasoline
CE	Civil Engineering
CES	Civil Engineering Squadron
DEEV	Civil Engineer Environmental Engineering
DET	Detachment
DOD	Department of Defense
DOE	Washington State Department of Ecology
DPDO	Defense Property Disposal Office
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
FAA	Federal Aviation Administration
FIS	Fighter Interceptor Squdron
FMS	Field Maintenance Squadron
ft	Foot (feet)
gpd	Gallons per day
gpy	Gallons per year
IRP	Installation Restoration Program
MAC	Military Airlift Command
MATS	Military Airlift Transport Squadron
MAW	Military Airlift Wing
Max.	Maximum

MEK	Methyl ethyl ketone
Min.	Minimum
MOGAS	Motor gasoline
NORAD	North American Defense Command
NDI	Non-destructive Inspection
NPDES	National Pollutant Discharge Elimination System
No.	Number
OEHL	Occupational and Environmental Health Laboratory
OMS	Organizational Maintenance Squadron
OVA	Organic Vapor Analyzer
PD-680	Safety solvent (petroleum distillate)
PCBs	Polychlorinated biphenyls
PCE	Perchloroethylene (also called tetrachloroethylene)
PCP	Pentachlorophenol
POL	Petroleum, oil, and lubricants
PMEL	Precision Measurement and Equipment Laboratory
RCRA	Resource Conservation and Recovery Act
SAGE	Semi-Automatic Ground Environment
STP	Sewage treatment plant
TAC	Tactical Air Command
TCE	Trichloroethylene
TDS	Total dissolved solids
TFWC	Tactical Fighter Weapons Center
TOC	Total organic carbon
TRANS	Transportation Squadron
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

EXECUTIVE SUMMARY

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A. INTRODUCTION

1. CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC) on 1 March 1982, to conduct the McChord AFB Records Search under contract No. F08637-80-G0010-0014, using funding provided by Military Airlift Command (MAC).

2. The Department of Defense (DOD) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981 and implemented by Air Force message dated 21 January 1982 as a positive action to ensure compliance of military installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. The purpose of DOD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DOD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that resulted from these past operations.

3. To implement the DOD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search phase, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase III (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or

restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

4. The McChord AFB Records Search included a detailed review of pertinent installation records, contacts with 26 individuals from outside agencies for documents relevant to the records search effort, a pre-on-site coordination visit, and an on-site base visit conducted by CH2M HILL 29 to 31 March, 6 and 7 April, and 14 April 1982. An outbriefing was held with the Base Commander, Col. Richard A. Virant, to discuss the purpose of the site visit and to present the major findings. Activities conducted during the on-site base visit included a review of the installation records, interviews with 81 past and present base employees, and ground and aerial tours of the base. The facilities included in the Records Search Program consisted only of those located within the existing boundaries of McChord AFB. Figures 2 and 3 in Section II show the general location of McChord AFB and the major features associated with McChord AFB in this report.

5. Potentially contaminated sites were rated using a modification of the hazard rating system developed by JRB Associates, Inc. The system was modified by the Air Force, CH2M HILL, and Engineering Science. The methodology used to identify the potentially contaminated sites included a review of base industrial activities, past waste management practices, and field investigations. If no hazardous waste contamination seemed likely at a particular site, it was deleted from further consideration.

At those sites where contamination was likely, a decision was made on whether the contaminants could migrate. If not, critical environmental concerns were presented to base personnel for appropriate action. If so, the site was rated and prioritized.

B. MAJOR FINDINGS

1. The majority of industrial operations that generate hazardous waste at McChord AFB have been in operation since 1939. Major industrial operations include vehicle maintenance shops, plating shop, jet engine shops, jet engine test cells, fuel system repair shops, pneudraulics shop, wheel and tire shops, corrosion control shops, AGE shops, and auto hobby shop. These industrial operations generate varying quantities of waste oil, waste hydraulic fluid, fuels, solvents, and cleaning compounds. Historically, the quantity of industrial wastes generated annually have remained relatively constant. Though there have been occasional short-term fluctuations, most reports indicated a relatively constant level of industrial activity at McChord AFB.

2. The timings and types of disposal methods varied widely, depending on the source of the wastes. In general, most industrial wastes have been disposed off base through contract removal or been discharged to the storm drain or sanitary sewer system since approximately 1960. However, significant use of leaching pits and storm drains to Clover Creek

continued until the early 1970's. Standard on-base disposal practices for these wastes have included:

- Dry wells or leaching-soakage pits
- Burning trenches
- Fire training areas
- Storm drain to Clover Creek
- On-site landfills
- Sanitary sewer

3. The records search and interview resulted in the identification of 60 past and present disposal sites. These sites included landfills, burial pits, leach pits, burning trenches, fire training areas, fuel spills, and POL spill/disposal area.

4. Permeable surficial soils and outwash gravels and deeper outwash sands and gravels underlie McChord AFB. A relatively impermeable glacial till separates the shallow deposits from the underlying outwash. The till provides only limited protection due to its variable extent and thickness. The outwash deposits above and below the till comprise the major aquifers for the area. Over 300 domestic and public water supply wells exist within 5 miles of the base.

5. Recent sampling of water supply wells in the McChord AFB area and Clover Creek has shown the presence of TCE, 1, 2 (trans) dichloroethylene, and other volatile organic compounds in the ground and surface water, on and downgradient from the base.

6. Evidence of environmental stress from industrial waste disposal practices was found in only a few instances and was very limited in extent. Disposal activities also do not appear to be detrimental to any endangered or sensitive species.

C. CONCLUSIONS

1. Information obtained through interviews with past and present base personnel, base records, outside organizations, and field observations indicate that hazardous wastes have been disposed on McChord AFB property in the past. Measured concentrations of TCE, 1, 2 (trans) dichloroethylene, and other volatile organic compounds in groundwater samples obtained from wells on base and generally downgradient from McChord AFB provide <u>indirect</u> evidence that the airbase is a potential source of groundwater contamination.

2. Industrial waste disposal practices including recharge to groundwater, discharge to surface drains and Clover Creek, burning in trenches and pits, and burial in landfills have provided potential sources of groundwater contamination.

3. Permeable surficial soils and underlying outwash deposits are in sufficient hydraulic connection to allow significant migration of hazardous contaminants to on- and off-base perched and regional groundwater aquifers.

4. High net annual infiltration of 19 to 23 inches of precipitation provides a significant driving force through the permeable surficial soils to continue groundwater contamination after disposal practices have ended.

5. Clover Creek may have been a source of groundwater contamination in the past because of the industrial wastes discharged directly to the creek

and the considerable amounts of creek water losses to groundwater above Steilacoom Lake.

6. The sanitary sewer system downstream of industrial facilities may be a source of contamination because significant quantities of industrial wastes have been discharged to the sewer in the past and there is a potential for exfiltration from these lines.

7. Table 7 in Section V presents a priority listing of the rated sites considered to provide the greatest potential for groundwater contamination. These sites are grouped together by their respective geographical areas (see Figure 18). Recommendations are presented for each of these areas or site groupings.

8. EOD practices in the Milburn Pond and golf course landfill areas pose a potential threat to drilling activities.

D. RECOMMENDATIONS

1. A major environmental monitoring program (Phase II of the Installation Restoration Program) should be implemented to determine the extent and degree of groundwater contamination at McChord AFB. The priority for monitoring at McChord AFB is considered high. The Phase II monitoring program should include: (1) installation, sampling, and analysis of 38 multi-zone groundwater monitoring wells, (2) sampling and analysis of subsurface soils at 9 sites, (3) geophysical investigations in 3 areas, and (4) sediment sampling at 4 locations.

2. Tables 8 and 9 in Section VI present a summary of recommended monitoring sites, parameters to be measured, and the rationale for selecting the parameters. The approximate locations for the various elements of the monitoring program are shown in Figure 19 in Section VI.

4. Though all the sites are potentially significant sources of contamination, they can be grouped in the following priorities:

   - Group 1 (first priority) - Areas A, B, C, D, E, and F

   - Group 2 (second priority) - Areas G, H, and I

   - Group 3 (third priority) - Area J and Clover Creek sediment

5. In addition to other minor items referred to later in the text, the base environmental monitoring program should implement a program of sanitary sewer testing for infiltration and exfiltration in areas serving industrial shops. The recommended monitoring program is extensive enough to detect contamination coming from most of the likely areas. These data would then be useful in identifying additional sources of contamination.

I. INTRODUCTION

I. INTRODUCTION

A. BACKGROUND

The purpose of the Installation Restoration Program (IRP) is to identify, report, and correct environmental deficiencies from past disposal practices that could result in groundwater contamination and probable migration of contaminants beyond DOD installation boundaries. To implement the IRP, the DOD issued Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) on 11 December 1981, which was implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program.

To conduct the Installation Restoration Program Records Search for McChord AFB, the AFESC retained CH2M HILL on 1 March 1982 under Contract No. F08637-80-G0010-0014 using funding provided by the Military Airlift Command (MAC).

The facilities included in the records search consist only of those located within the existing boundaries of McChord AFB, Washington.

The Records Search comprises Phase I of the IRP and is intended to review installation records to identify possible hazardous waste contaminated sites and potential problems that may result in contaminant migration. Phase II (not part of this contract) consists of follow-up field work as determined from Phase I. Phase III (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part

of this contract) includes those efforts which are required to control identified hazardous conditions.

B. AUTHORITY

Identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981 and implemented by Air Force message dated 21 January 1982 as a positive action to ensure compliance of military installations with environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program.

C. PURPOSE OF THE RECORDS SEARCH

DOD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DOD facilities, to control the migration of hazardous contamination, and to control hazards to health or welfare that resulted from those past operations. The potential for adverse impact was evaluated at McChord AFB by reviewing the existing information, conducting interviews, and making a detailed analysis of installation records. Pertinent information involves the history of operations, the geological and hydrogeological conditions that may contribute to the migration of contaminants, and the ecological settings that indicate sensitive habitats or evidence of environmental stress resulting from contaminants.

D. SCOPE

The records search consisted of a pre-performance meeting, a pre-on-site base visit, an on-site base visit, a review and

analysis of the information obtained, and preparation of this report.

The pre-performance meeting for McChord AFB was held at the northwestern regional office of CH2M HILL, Bellevue, Washington, on 3 March 1982. Representatives of the AFESC, USAF Occupational and Environmental Health Laboratory (OEHL), Military Airlift Command (MAC), McChord AFB, and CH2M HILL attended this meeting. The objectives of this meeting were to provide detailed project instructions for the records search, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the McChord AFB records search. The pre-on-site visit was held on 15 and 19 March 1982 to gather additional record information and coodinate the base visit by the full project team.

The on-site base visit was conducted by CH2M HILL on 29 to 31 March, 6 and 7 April, and 14 April 1982. An outbriefing was held with the Base Commander, Col. Richard A. Virant, to describe the purpose of the site visit and to present the major findings. Activities performed during the on-site base visit included a detailed search of installation records, ground and aerial tours of the installation, and interviews with 81 former and present base personnel. Twenty-six individuals with various outside agencies (see Appendix B) were contacted for documents relevant to the Records Search effort. The following individuals were on the CH2M HILL records search team:

1. Mr. Steve Hoffman, Project Manager (B.S., Civil Engineering, 1971)

2. Mr. Michael Kemp, Assistant Project Manager (M.S., Civil and Environmental Engineering, 1978)

3. Mr. Scott Dethloff, Civil and Environmental Engineer (M.S. Civil Engineering, 1981)

4. Mr. Jeff Randall, Hydrogeologist (M.S., Hydrology, 1974)

5. Ms. Jane Gendron, Ecologist (B.A., Biology, 1976)

Resumes of these team members are included in Appendix A.

Individuals from the Air Force who participated in the McChord AFB Installation Restoration Program included:

1. Mr. Bernard Lindenberg, AFESC, Program Manager, Phase I

2. Lt. Col. Dean D. Nelson, MAC Bioenvironmental Engineer

3. Capt. Ron Sharpe, MAC Program Manager, Phase I

4. Mr. Chris Krance, McChord AFB, Environmental and Planning Engineer, 62 CES/DEEV

5. Mr. John Sweet, McChord AFB, Phase I Investigation Coordinator, 62 CES/DEEV

6. Capt. Lindsey Waterhouse, McChord AFB, Bioenvironmental Engineer

7. Major Gary Fishburn, USAF OEHL, Program Manager, Phase II

E. METHODOLOGY

The methodology used in the McChord AFB records search is shown graphically in Figure 1. First, a review of past and present industrial operations was conducted at the base.

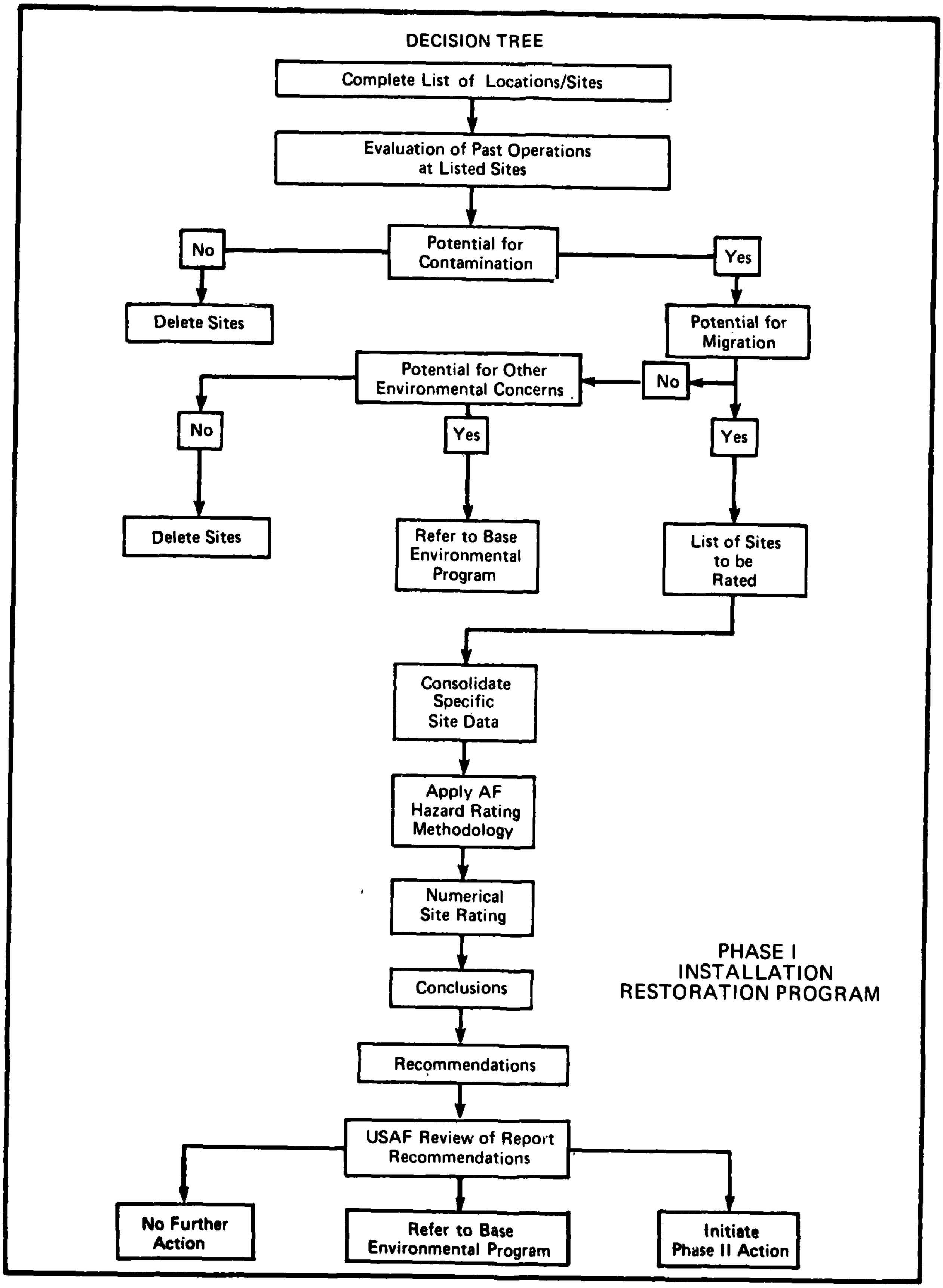

Figure 1
RECORDS SEARCH METHODOLOGY

Information was obtained from available records such as shop files and real property files, as well as interviews with past and present employees from the various operating areas of the base.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various industrial operations on the base. Included in this part of the activities review was the identification of all past landfill sites and burial sites, as well as any other possible sources of contamination such as major PCB or solvent spills or fuel-saturated areas resulting from large fuel spills or leaks.

General ground and aerial tours of identified sites were made by the records search team to gather site-specific information including (1) evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, on whether a potential exists for hazardous material contamination in any of the identified sites. If not, the site was deleted from further consideration. If minor operations and maintenance deficiencies were noted during the investigations, the condition was reported to the Base Environmental Coordinator for remedial action.

For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific soil and groundwater conditions. If there was no potential for contaminant migration, but other environmental concerns

were identified, the site was referred to the base environmental monitoring program for further action. If no further environmental concerns were identified, the site was deleted from consideration. If the potential for contaminant migration was considered significant, then the site was rated and prioritized using the site rating methodology described in Appendix H.

The site rating indicates the relative potential for environmental impact at each site. For those sites showing a high potential for adverse impact, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a moderate potential for adverse impact, limited analyses may be desirable to confirm that a contaminant migration problem does not exist. For those sites showing a low potential of adverse impact, the site may be referred to the base environmental program and no Phase II work will be recommended.

II. INSTALLATION DESCRIPTION

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A. LOCATION

McChord AFB is located in western Washington approximately 5 miles east of Puget Sound and 1 mile south of the City of Tacoma. The Cascade mountain range is about 25 miles east of McChord. Mt. Rainier is 40 miles in a southeasterly direction. The Olympic Mountains are approximately 45 miles west of McChord across Puget Sound. The location of this facility is shown in Figure 2. A site map for McChord AFB is shown in Figure 3.

B. ORGANIZATION AND MISSION

The 62nd Military Airlift Wing (MAW) is the host unit on McChord AFB. It is part of the Military Airlift Command (MAC). The mission of MAC is to provide a fast, flexible, responsive airlift capability for the Department of Defense. The mission of the 62nd MAW is to provide for airlift of troops, cargo, military equipment, passengers, and mail during peacetime or wartime. McChord is also home for the 25th NORAD Region and the 25th Air Defense Squadron, the 318th Fighter Interceptor Squadron (FIS), and the 446th Military Airlift Wing (Assoc.).

A more detailed discussion of the base history and mission is included in Appendix C.

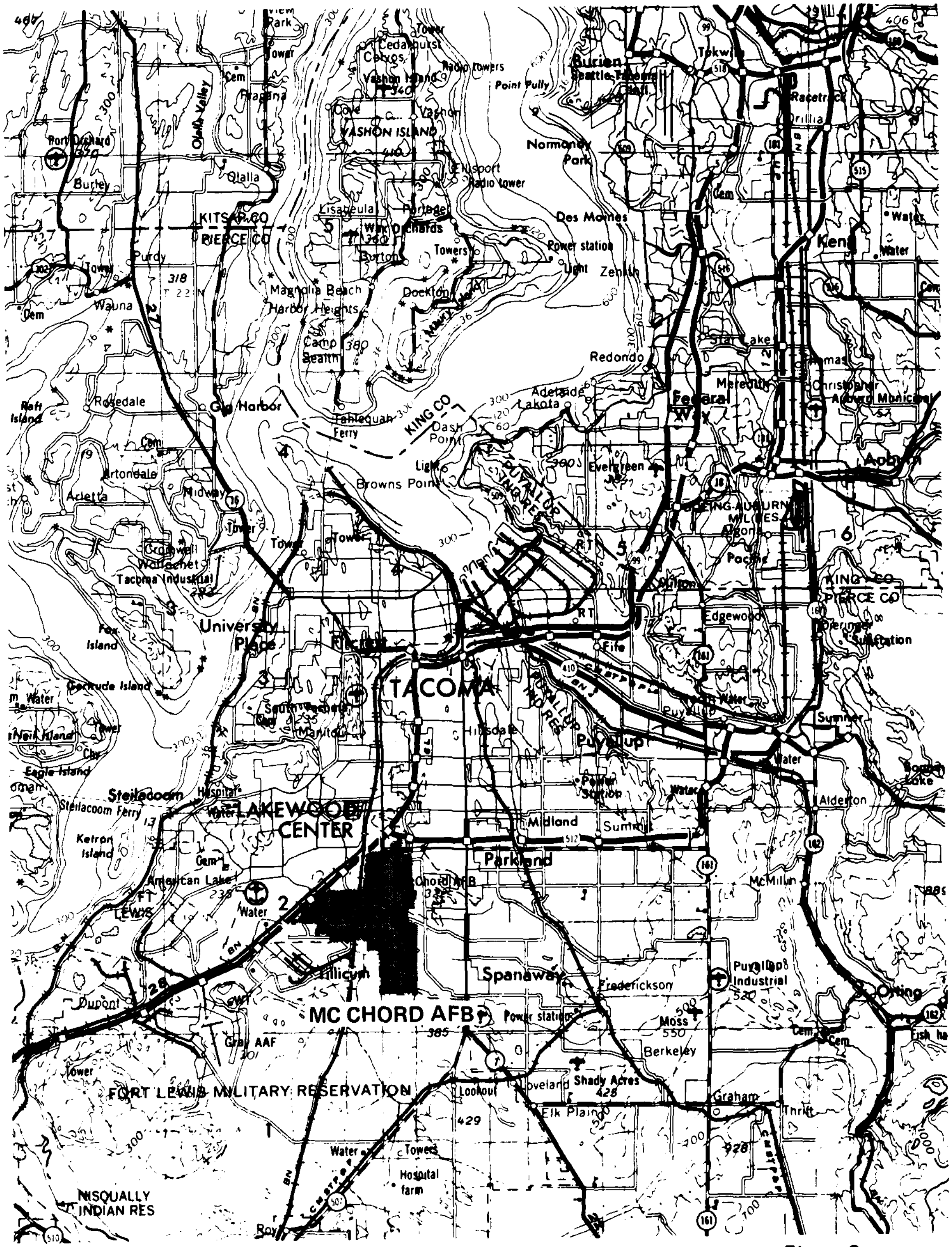


Figure 2
LOCATION MAP
MC CHORD AFB

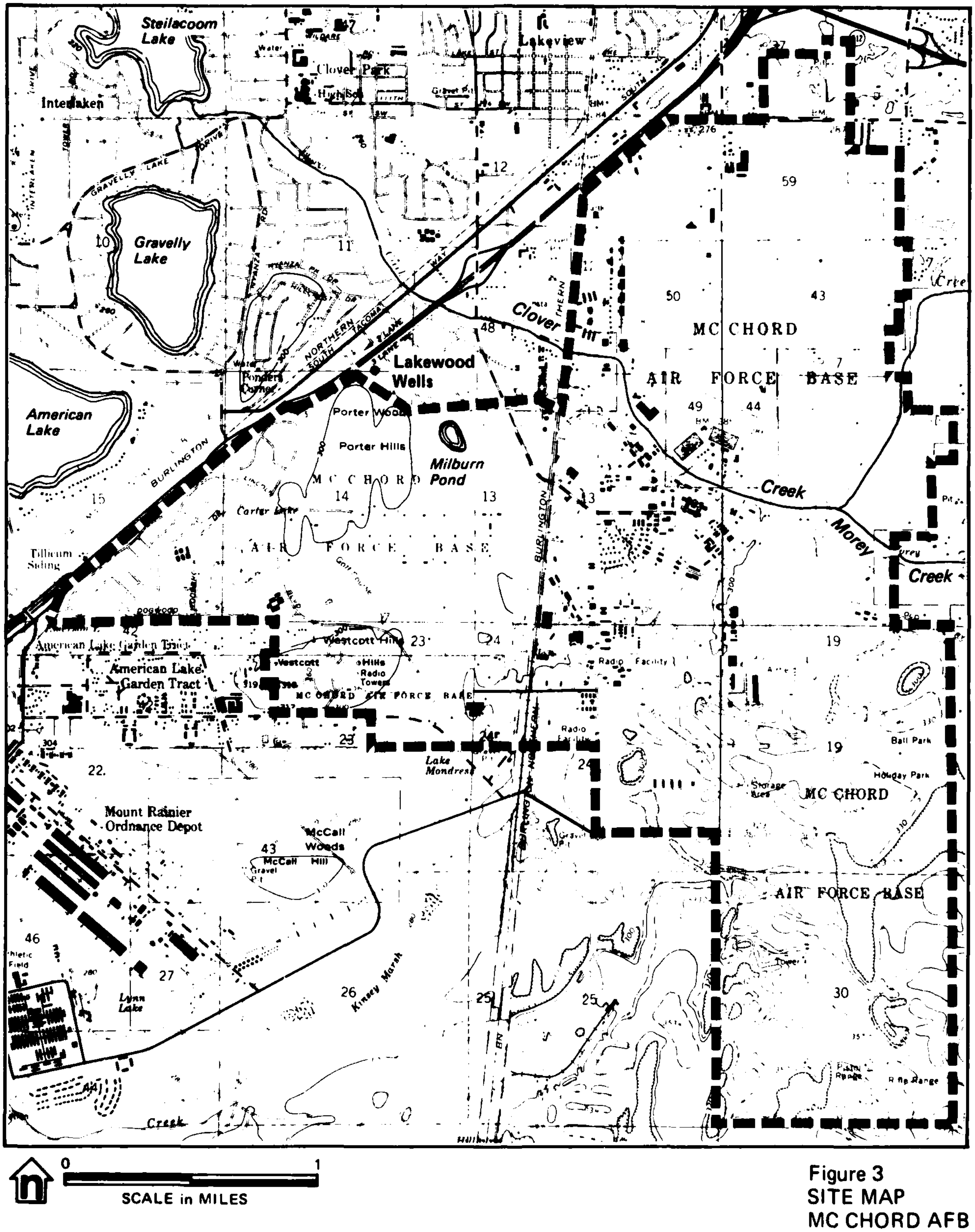


Figure 3
SITE MAP
MC CHORD AFB

III. ENVIRONMENTAL SETTING

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

McChord Air Force Base is located in an area that has a temperate maritime climate with warm dry summers and cool wet winters. The climate is characterized by a pronounced seasonal distribution of precipitation, with almost 32 inches of its yearly average of 39 inches occurring from October through April. The "dry" season from May to September receives 18 percent of the annual precipitation. Mean annual snowfall is only about 11 inches; snowfalls seldom accumulate to depths greater than a few inches.

Temperatures in the McChord AFB area are mild because of the low elevation (about 320 feet above MSL) and the moderating effect of Puget Sound and the Pacific Ocean. Average daily highs reach 75 degrees F in July and August, while average daily lows dip to 32 degrees F during January. The average frostfree growing season is about 250 days. The prevailing wind direction is south to southwest. The period of maximum evaporation potential occurs during the summer months when temperatures are highest and precipitation is least with the reverse being true in the winter. This "out-of-phase" relationship between precipitation and evaporation results in greater surface runoff and greater recharge to aquifers than would otherwise occur. For Tacoma and the Puyallup Experiment Station, actual evapotranspiration is estimated to be 20 inches annually based on a 6-inch soil water capacity. Assuming that the soil capacity at McChord AFB ranges from 6 inches to 2 inches and based on annual average precipitation, it is estimated that 19 to 23 inches of net annual infiltration occur at McChord AFB. Table 1 summarizes climatological data from the weather station at McChord AFB.

Table 1
CLIMATOLOGICAL DATA FOR McCHORD AIR FORCE BASE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature (°F)												
Normal mean	38	42	44	48	55	60	64	64	59	51	44	40
Daily high	44	49	52	58	65	69	75	75	69	60	51	46
Daily low	32	34	35	39	44	50	53	52	48	43	37	34
Record high	61	71	74	83	91	99	100	98	96	82	72	64
Record low	6	1	12	27	27	35	39	41	31	20	2	0
Precipitation (in)												
Normal mean	6.0	4.3	3.7	2.7	1.6	1.6	0.8	1.1	1.8	3.8	5.7	5.7
Record high	12.4	10.4	7.0	5.7	4.1	4.2	2.6	5.4	5.1	7.6	11.6	10.6
Record low	0.6	1.4	0.6	0.3	0.1	0.1	0.0	0.0	0.2	0.9	1.2	2.4
Relative humidity (%)												
4 a.m. mean	89	89	88	88	87	87	87	88	91	92	92	91
1 p.m. mean	78	70	63	58	56	57	53	55	59	69	76	81
Surface wind												
Mean velocity (Kt)	5	5	5	5	5	5	5	4	4	4	4	4
Prevailing direction	S	S	S	S	SW	SW	W	SW	S	S	S	S

Source: AWS Climatic Brief, prepared by USAFETAC, 1974.
Station: McChord AFB, Washington.
Period of Record: July 1940-July 1972.

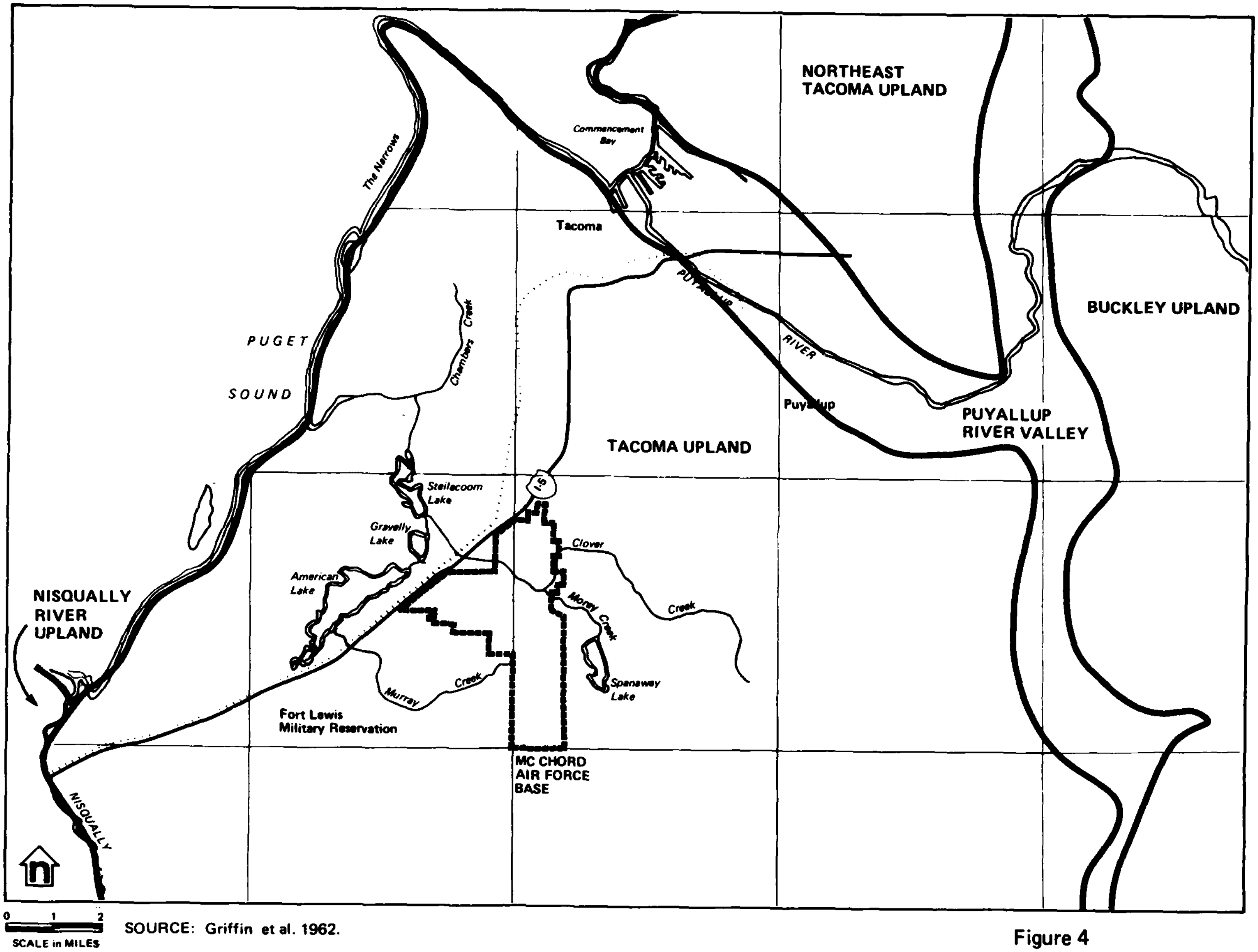
Note: Data shown in table have been checked monthly with updated from 1972 to 1982. No significant changes have occurred and an update table has not been prepared.

B. GEOLOGY AND SOILS

McChord AFB is situated in the Puget Sound Lowland, a broad plain that is bordered by the Olympic Mountains to the west and the Cascade Mountains to the east. Elevations range from about 200 to 700 feet above sea level, which is several thousand feet lower than the mountain ranges on either side. Marine embayments (inlets of Puget Sound) have divided the plain into numerous isolated remnants or upland areas. McChord AFB is located on the Tacoma Upland, a gently rolling plain with a gradual slope to the northwest. It is bordered by Puget Sound on the west, Commencement Bay on the north, the Puyallup River valley on the northeast and east, the Ohop Valley on the southeast, and the Nisqually River valley on the southwest. Figure 4 shows the physiographic subareas of the Tacoma region.

1. Geology

A detailed discussion of the geology of the Tacoma area has been presented by Griffin et al. (1962) and Walters and Kimmel (1968). They describe the Puget Sound Lowland, including the Tacoma Uplands, as an elongated, north-south trending structural depression known as the Puget Trough. The foothills of the mountain ranges on either side of the trough form its eastern and western walls. The Olympic and Cascade Mountains are composed of volcanic, metamorphic, and consolidated sedimentary rocks. These geologic materials were originally deposited in a gradually subsiding coastal plain as lacustrine (lake) sediments interspersed with periodic basalt flows. After these rocks underwent deformation during the mountain-building episodes, the resulting Puget Trough provided a depression for deposition of alluvial and glacial sediments. These sediments include clay, silt, sand, gravel, glacial till, and thin strata of peat, and are more than



SOURCE: Griffin et al. 1962.

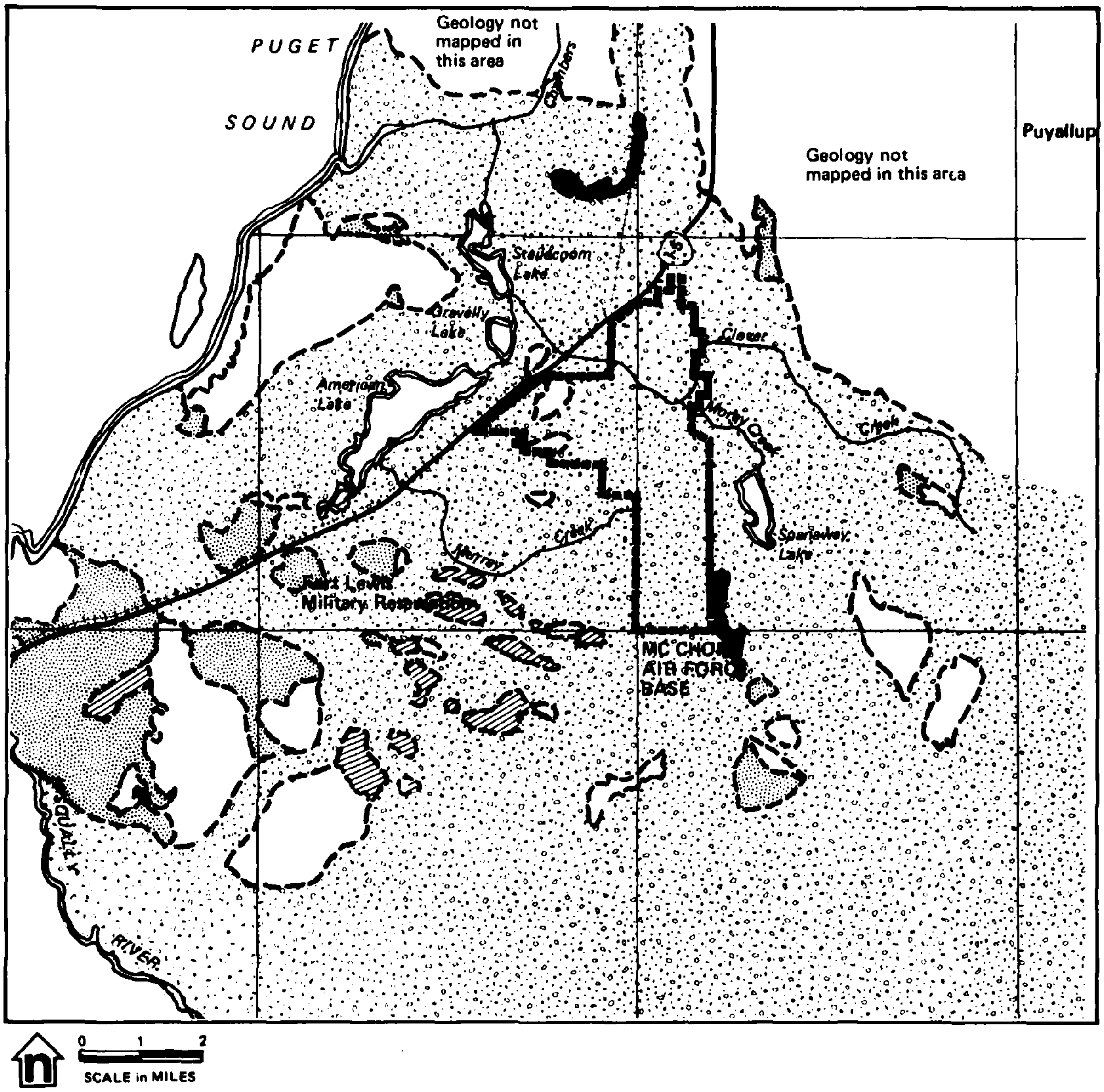
Figure 4
GEOLOGIC SUBAREAS
MC CHORD AFB

2,000 feet thick in some areas of the trough. The oldest unconsolidated deposits are of Tertiary Age and consist of fluvial and lacustrine deposits.

The end of the Tertiary Period and beginning of the Quaternary Period (70 million years ago) marked the beginning of glaciation in the Puget Sound Lowland. Great thicknesses of glacial drift were deposited during three or four glacial episodes. The major interglacial intervals allowed fluvial and lacustrine sediments, and sometimes eolian and peat deposits, to accumulate on the glacial deposits.

Deep wells near McChord AFB penetrate many hundreds of feet of the unconsolidated sediments. One well indicates that the depth to bedrock is greater than 2,000 feet (Walters and Kimmel 1968). The upper 200 feet of these sediments are glacial deposits known as the Vashon Drift. This drift was deposited about 15,000 years ago by the last advance of the Puget glacier lobe. Figure 5 shows that, with the exception of some localized recent peat deposits, all surficial deposits at McChord AFB are Vashon Drift of Pleistocene age. Five main strata within the Vashon Drift have been identified in central Pierce County (Steilacoom gravel, ablation and lodgement till, advance outwash, and Colvos sand). However, the lithologic variability in individual strata makes stratigraphic correlation using local well logs very difficult and uncertain.

Most of McChord AFB is mantled by surficial deposits of the Steilacoom gravel. This unit, although absent in some places, may be 60 feet or more in thickness. The Steilacoom deposits are composed of generally coarse gravel and pebbles that were deposited or reworked by the discharge of Lake Puyallup, a lake formed at the ice front during the retreat of the Puget Lobe. The consistently coarse texture of the



Peat

Qp — Organic material deposited chiefly in closed depressions. Thickness ranges from a few feet to as much as 48 feet. In part, older than Osceola Mudflow. Is not a source of potable water in central Pierce County.

Steilacoom Gravel

Qs — Pebble to cobble gravel and bounders. Thickness ranges from a few feet to about 60 feet, except in deltas where it is as much as 200 feet. Locally yields large quantities of water where saturated.

Recessional outwash

Qvr — Principally stratified sand and gravel, but locally contains silt and clay. Thickness ranges from a few feet to several hundred feet. Generally above water table; locally small yields are obtained from shallow wells.

Vashon Till

Qvt — Mixture of gravel, sand, silt, and clay composed of 2 distinct parts - lodgement and ablation till. The formation underlies the recessional outwash. Thickness commonly 25 to 50 feet, but can be only a few feet locally. Yields small to moderate quantities of water to many wells and large quantities to a few wells.

Qgu — **Vashon Drift, undifferentiated**

Figure 5
AREAL GEOLOGY OF
CENTRAL PIERCE COUNTY
MC CHORD AFB

SOURCE: Walters and Kimmel. 1968.

Steilacoom gravel is the main feature that distinguishes it from other types of recessional outwash that were deposited by meltwater from the receding glacier. The surface of the Steilacoom gravel is characterized by irregularly shaped "kettles" that formed when large blocks of ice deposited within the gravel melted. Some of these closed depressions contain the youngest geologic deposit occurring at the base, peat deposits that have formed from partially decomposed organic debris.

Underlying the Steilacoom gravel is glacial till, the most widespread geologic unit in the uplands. The till, which is exposed at the surface in the western portion of the base, generally ranges in thickness from 5 to 30 feet but is sometimes totally absent. It is composed of two distinct parts--lodgement and ablation till. Lodgement till is a compact, cement-like mixture of gravel, sand, silt, and clay. It was deposited beneath the ice sheet and compacted by the weight of the ice. Ablation till consists of loose, unstratified material that was literally dumped in place when the ice melted. Lodgement till is laterally continuous over most of the area, whereas the overlying ablation till is not.

Advance outwash gravel underlies the Vashon till. These stratified and well-sorted sediments were deposited in front of the advancing Puget lobe by meltwater streams. The thickness of the gravel is variable but generally ranges from 25 to 50 feet. It is underlain by the oldest type of Vashon Drift, the Colvos sand. This sand, which contains some beds or lenses of gravel, was deposited by south-flowing meltwater streams. The basal portion of the unit consists of a blue-gray silty clay that was probably deposited in a proglacial lake that formed in front of the advancing ice sheet. The thickness of the Colvos sand (including the basal clay) exceeds 150 feet. The bottom of the unit probably lies at

about sea level to 100 feet above sea level. Immediately underlying the Colvos sand is the pre-Vashon Kitsap Formation, a unit composed of fluvial (sand and gravel) and marsh (clay and peat) sediments that were deposited in a nonglacial climate prior to the Vashon glaciation. The Kitsap, which may be up to 150 feet thick, was deposited on top of glacial drift from the previous Salmon Springs glacier. This drift, consisting mainly of stratified sand and gravel with thin, dicontinuous beds of silt and clay, has been designated the Salmon Springs Drift.

Figure 6 is a generic representation of the geologic section in the McChord AFB area.

2. Soils

Soils at McChord AFB and Fort Lewis Reservation were not mapped by the Soil Conservation Service when they completed their soil survey of the Pierce County area (Zulauf 1979). The mapping of the areas surrounding the military lands provides a basis for predicting what types of soils exist on the base. The soil association occurring at McChord AFB is the Spanaway association and consists of nearly level uplands having somewhat excessively drained soils that formed in glacial outwash. The association is predominantly composed of Spanaway soils, but a number of other soil types may be present in varying proportions. On McChord AFB, three distinct types of soil are believed to be present: the Spanaway gravelly sandy loam, the Spana loam, and the Dupont muck.

The Spanaway gravelly sandy loam probably occurs over the great majority of the base. The soil is formed in glacial outwash mixed in the upper part with volcanic ash. Grass and conifers vegetate this nearly level to undulating soil. Permeability is moderately rapid (2.0 to 6.0 in/hr, or 1.4

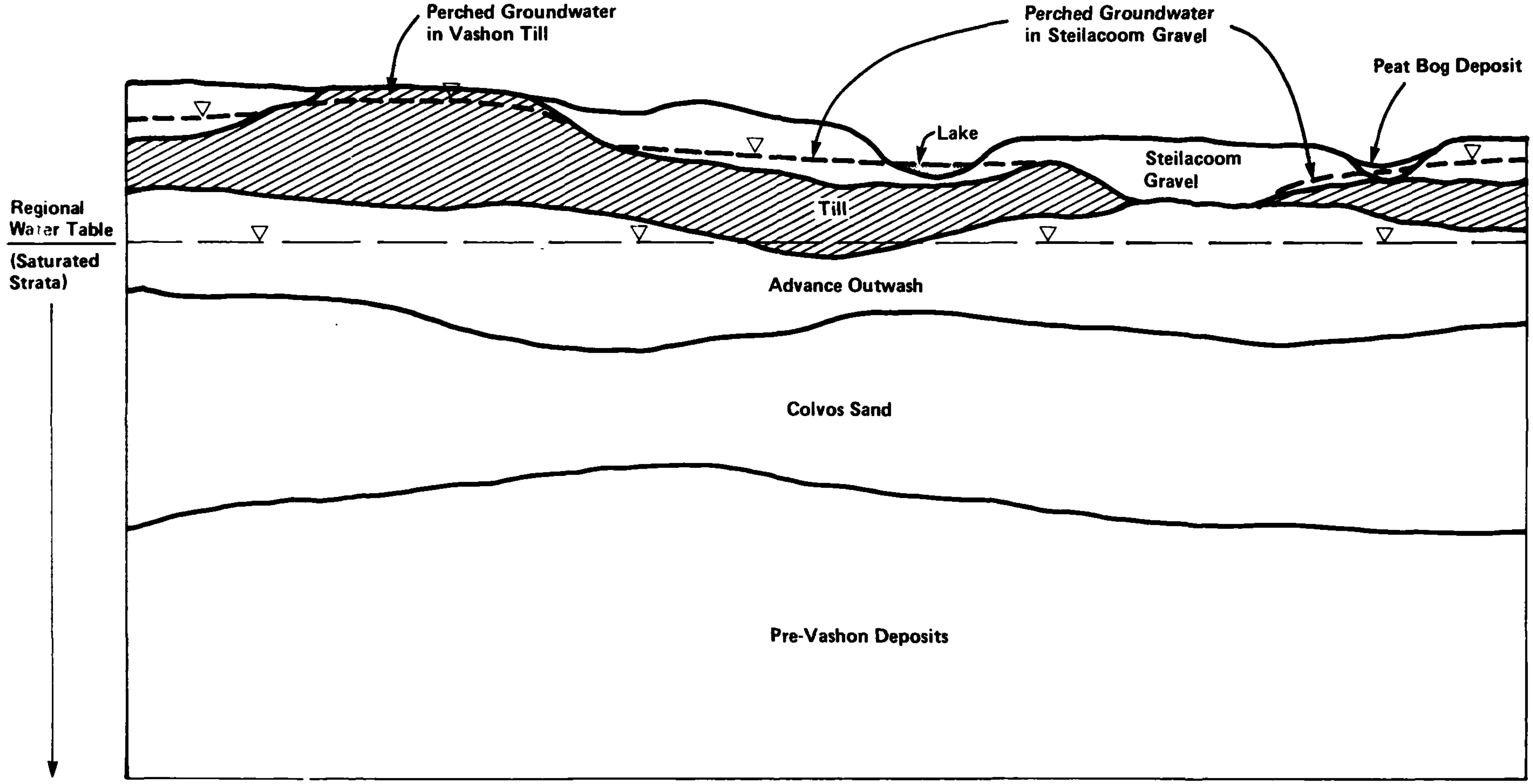


Figure 6
GENERIC GEOLOGIC SECTION
AT MC CHORD AFB AND VICINITY

to 4.2 x 10^{-3} cm/sec), and available water capacity is low. The soil is never flooded, and there is little erosional hazard because surface runoff is slow.

The Spana loam is a somewhat poorly drained, nearly level soil that occurs in long, narrow depressions and along Clover Creek. It formed in alluvium containing volcanic ash over very gravelly alluvium. Grass and scattered deciduous trees are present on the Spana loam. Permeability is moderate (0.6 to 2.0 in/hr, or 4.2 x 10^{-4} to 1.4 x 10^{-3} cm/sec), and available water capacity is moderate. The level terrain causes runoff to be very slow or ponded, so there is no erosional hazard. Flooding is frequent from December through April, and the water table is often within less than 3 feet of the surface during these months.

Another soil that may be present in narrow, closed depressions on the base is the Dupont muck. This level, organic-rich soil is very poorly drained. The Dupont muck is formed in decomposing vegetation and is actually a peat soil in places. Permeability is moderately slow (0.2 to 0.6 in/hr, or 1.4 to 4.2 x 10^{-4} cm/sec), and available water capacity is high. Surface water is ponded in these closed depressions, resulting in no erosional hazard. Flooding is common from November to May, and the water table is often within 1 foot of the ground surface.

C. HYDROLOGY

Griffin et al. (1962) estimated that 50 to 60 percent of the yearly precipitation becomes groundwater recharge. Two factors are largely responsible for this: (1) gentle slopes and permeable soils favor infiltration over runoff, and (2) the majority of the yearly precipitation occurs during winter months when evaporation potential is lowest. A small

portion of the precipitation reaching the water table is eventually lost through evaporation or transpiration by plants (especially where the water table is shallow), but most recharge remains in the groundwater system until it is removed by pumping or naturally discharged through springs or seeps.

1. Surface Water

Drainage in the Tacoma Uplands generally tends to the northwest, toward Puget Sound and Commencement Bay. Figure 7 shows the topography and surface drainage of McChord AFB and its surrounding area. Clover Creek, a perennial stream, provides the only natural drainage at McChord AFB. This stream originates a few miles east of the base. A tributary stream, Morey Creek, drains nearby Spanaway Lake and joins Clover Creek just inside the eastern boundary of the air base. Clover Creek flows northwest through the base and discharges into Steilacoom Lake, which then drains through Chambers Creek into Puget Sound. In total, the Chambers-Clover Creek drainage basin covers 210 square miles, and the base lies totally within this area. In the upper portion of the basin (above and including McChord AFB), Clover Creek and its tributaries drain about 68 square miles. Because of the irregular topography, the surface drainage pattern is indistinct in the southern and eastern extremities of the basin. The McChord AFB property is dotted with a few small lakes or bogs, but all of the major lakes of the basin are located beyond the base's boundaries.

2. Groundwater

Precipitation that reaches groundwater table moves by gravity toward areas of discharge. The regional direction of groundwater movement in the Tacoma Upland is northwest toward

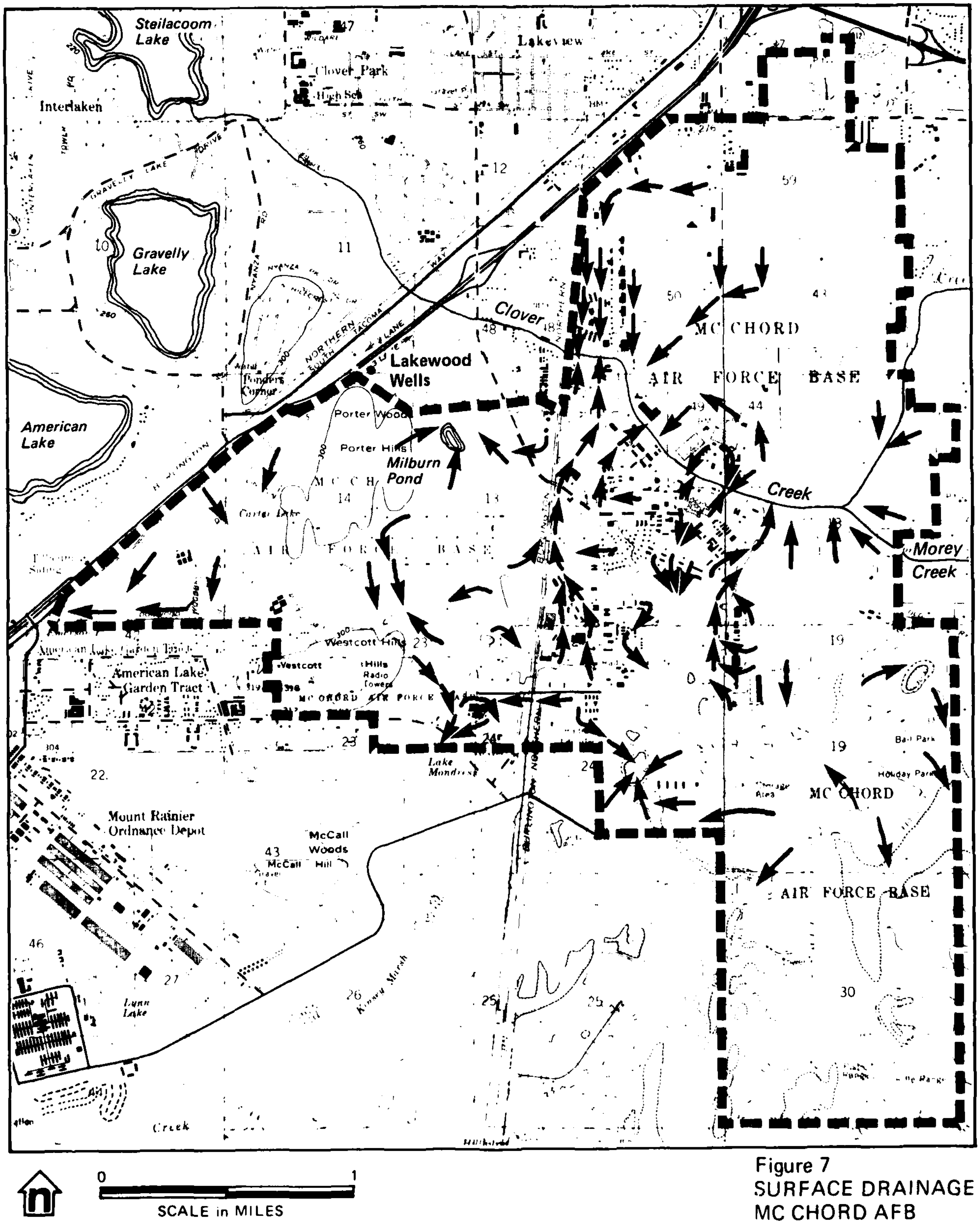
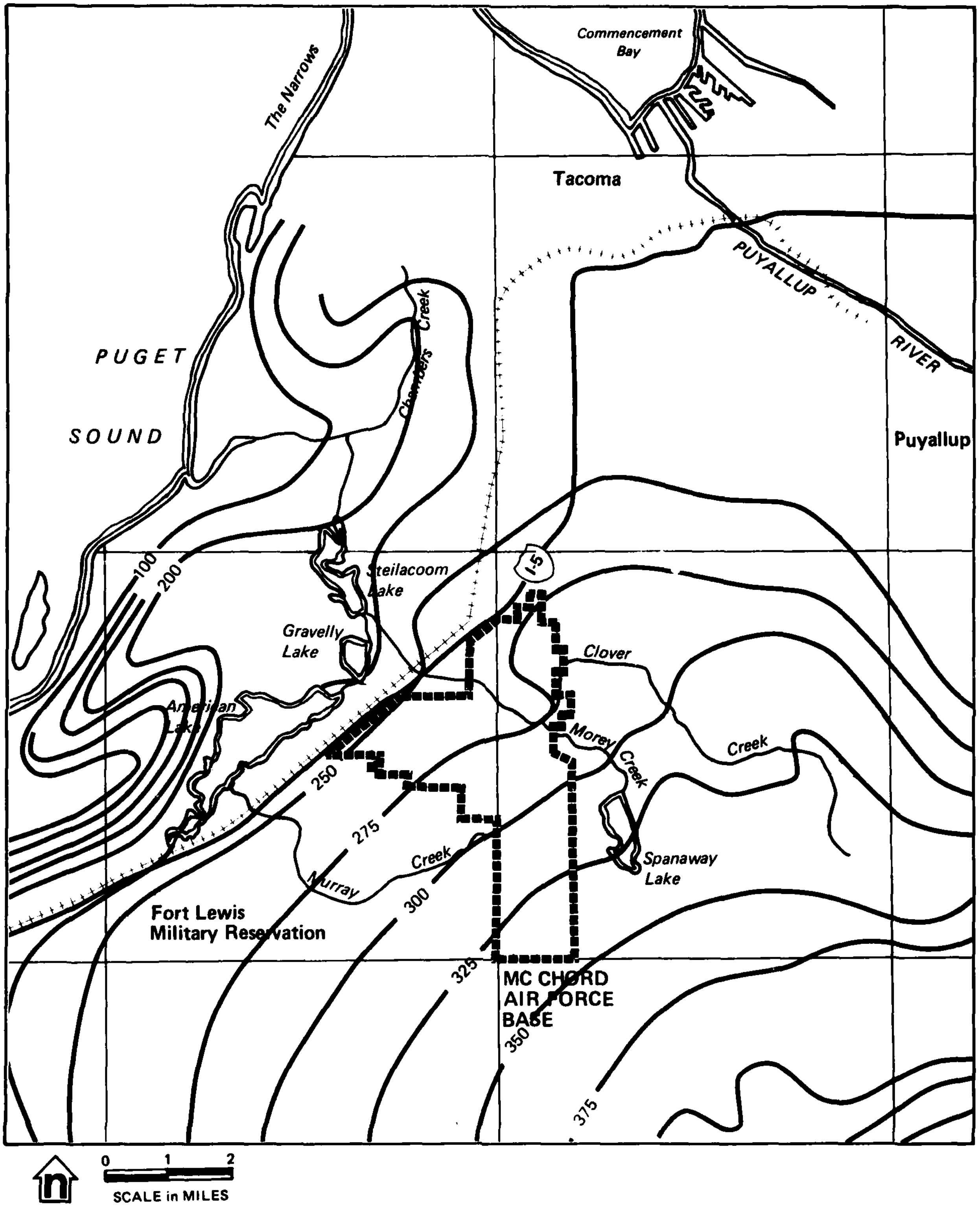


Figure 7
SURFACE DRAINAGE
MC CHORD AFB

Puget Sound, as shown on the water-table map in Figure 8. The slope or hydraulic gradient of the water table is irregular across the upland. The steeper gradients generally occur in the less permeable aquifer material. At McChord AFB, groundwater flows mainly to the northwest under a gradient of about 20 feet per mile. Considerable interchange between surface water and groundwater occurs on the uplands. Shallow groundwater bodies perched on relatively impermeable strata often discharge through springs into many of the area's small lakes and ponds. Downward percolation from these perched or semiperched aquifers and from the ponds recharges the underlying saturated material that forms the regional groundwater body. Some lakes in the upland, such as Gravelly and American Lakes, lose water to the water table through seepage along their western margins. The small lakes on the McChord AFB property appear to be in approximate balance with the water table, with some seasonal variations. Between McChord AFB and Steilacoom Lake, Clover Creek loses considerable amounts of water to the aquifer. Upper Clover Creek and its north fork (upstream of McChord AFB) sometimes lose their entire flow through their permeable stream beds. On McChord AFB property, some flow loss probably continues except where Clover Creek flows through a culvert and is therefore isolated from the underlying aquifer. Stream-aquifer relationships can be expected to change with the seasonal fluctuations of the water table. Increased recharge to the groundwater body during the wet months will raise the water table as the amount of water in storage increases. Some streams may stop losing water and become effluent, or gaining, along portions of their courses. Individual storm events can cause abrupt fluctuations in groundwater levels, especially if the water table is relatively near the surface. Generally, water-level changes in perched or semiperched aquifers will be greater and more



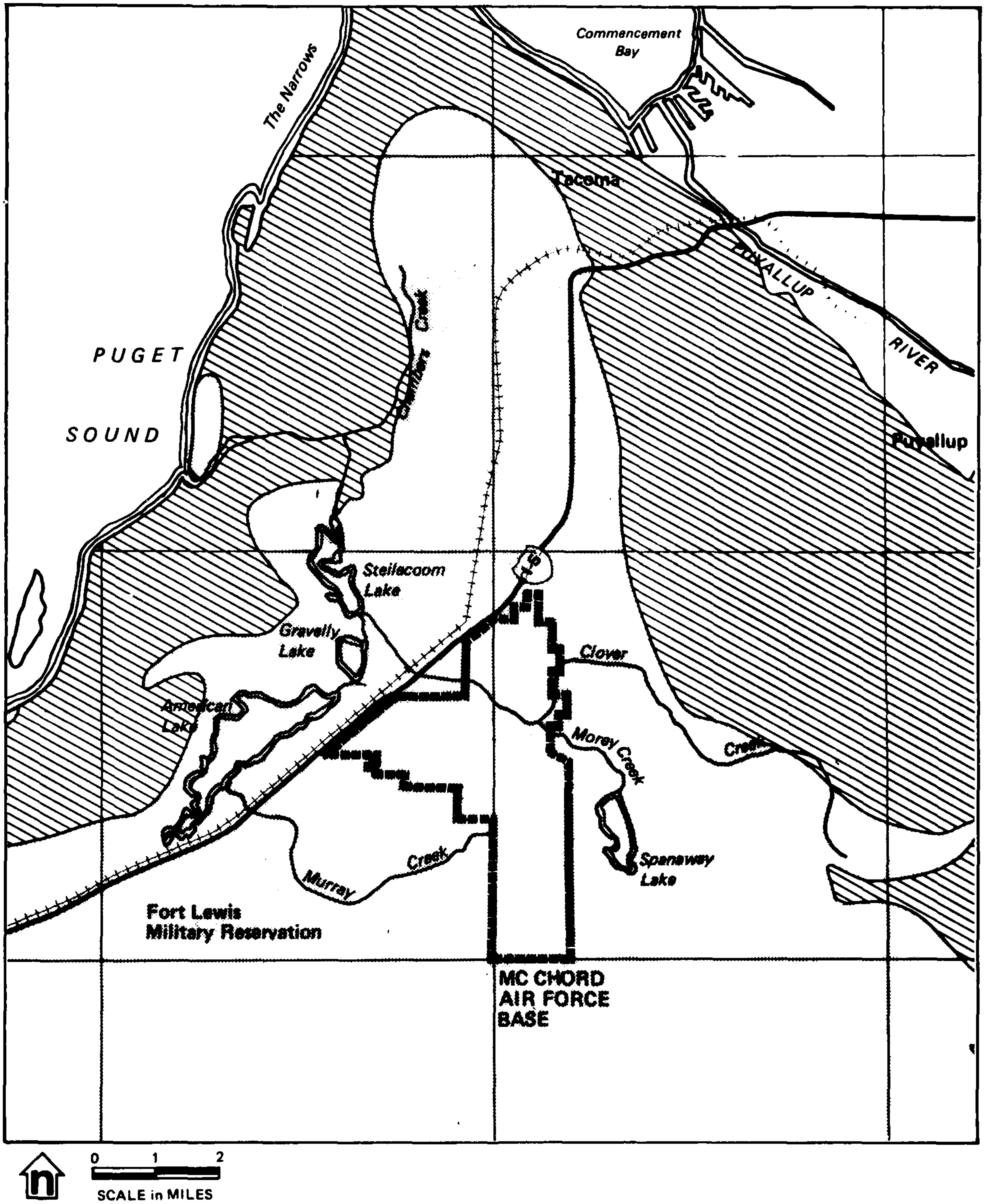
SOURCE: Walters and Kimmel. 1968.

Figure 8
WATER TABLE CONTOURS
MC CHORD AFB

abrupt than water-level fluctuations in the deeper, regional groundwater body.

The major aquifers of the Tacoma Upland can be classified into two general categories (see Figure 9). Aquifers in the central part of the upland are chiefly outwash deposits of Vashon age. Most of this material is very coarse and yields moderate to large quantities of water to wells. The deeper pre-Vashon deposits are also an important groundwater source, but these aquifers are generally less permeable. Along the margins of the Tacoma Upland, however, these pre-Vashon deposits comprise the major aquifers. Here, the Vashon deposits lie above the regional water table and often contain perched or semiperched groundwater bodies that yield only small quantities of water.

A number of aquifers are present in the McChord AFB area. Figure 6, a generic representation of a geologic section of the area, illustrates the general groundwater conditions that exist in these units. Shallow wells tap the Steilacoom Gravel or other Vashon recessional outwash deposits. Good yields are sometimes obtained from these permeable deposits, but the gravel units often lie above the regional water table or are too thin to be considered important aquifers in most places. When present, groundwater in the Steilacoom Gravel is perched above the main water table by the underlying, relatively impermeable Vashon till. The till itself is sometimes a water source for shallow dug wells. Small yields are obtained when the compacted lodgement till causes groundwater to be perched in the more permeable ablation till. Vashon advance outwash gravel is the most important groundwater source for domestic wells in central Pierce County. Moderate yields are obtained from the well-sorted gravels of this deposit. The underlying Colvos Sand also has gravel beds and well-sorted sands, making it a suitable aquifer for



Aquifers, chiefly outwash sand and gravel of Vashon age and overlying coarse alluvium of Recent age. Generally yield moderate to large quanities of water.

Aquifers, chiefly sand and gravel of pre-Vashon age. Generally yield small to moderate supplies, but at places large yields have been obtained. Aquifers overlain at most places by deposits of vashon or Recent age, which generally yield small quanities of perched or semiperched ground water.

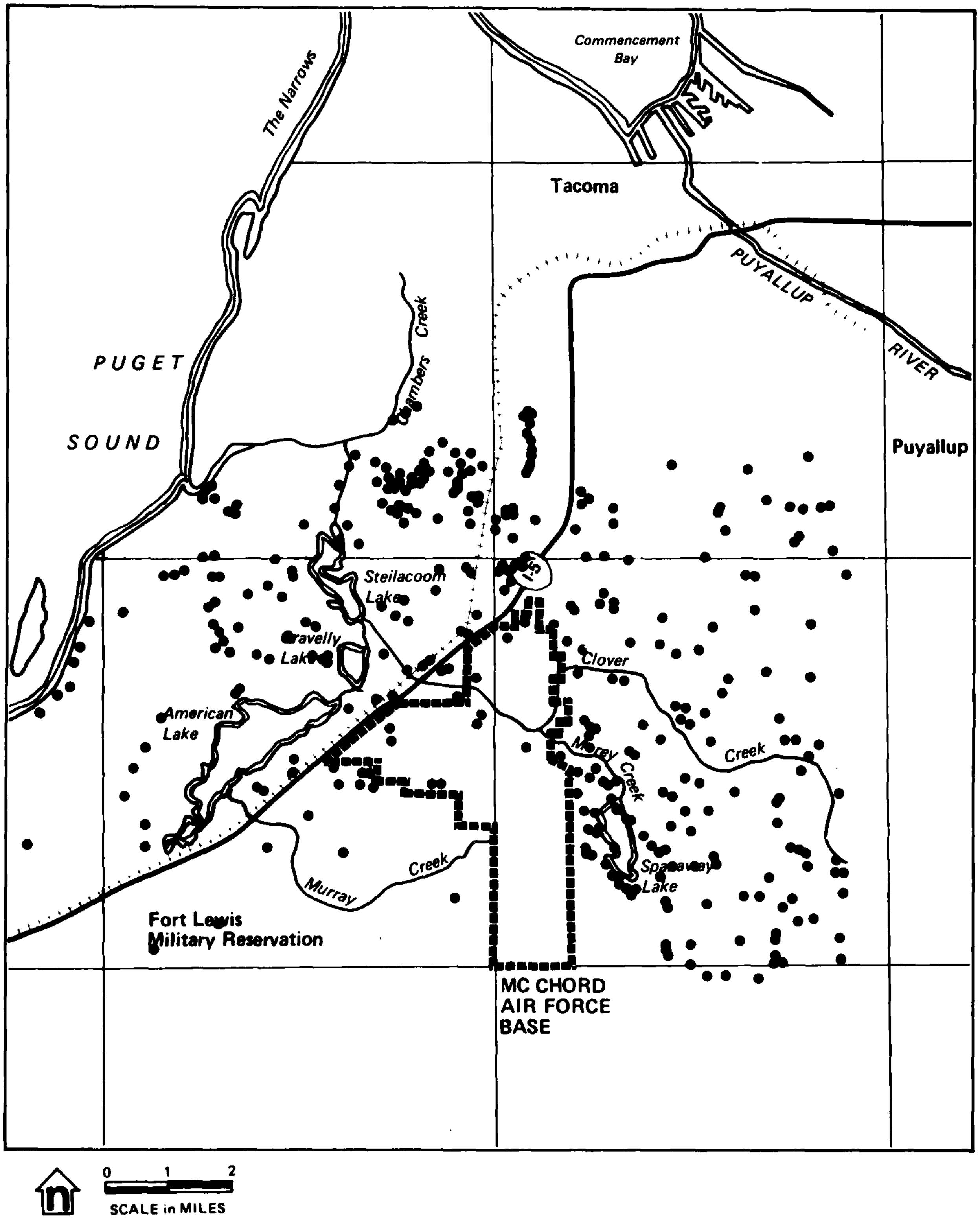
Figure 9
AQUIFER DISTRIBUTION
MC CHORD AFB

SOURCE: Griffin et al. 1962.

some wells. Deeper aquifers in pre-Vashon deposits have also been penetrated by many wells in the area. Most of the Kitsap Formation is too fine grained to be a good aquifer, but its lower unit does contain some very permeable beds of relatively clean sand and gravel. Yields from the Salmon Springs Drift are variable, ranging from small to very large.

Figure 10 shows more than 300 wells within an approximate 5-mile radius of McChord AFB as identified by Walters and Kimmel (1968). Since 1968, numerous additional wells have been drilled in the area. The wells in Figure 10 range in depth from less than 20 feet to more than 2,200 feet. Overall, the wells east of the air base (T.19N., R.3E.) are not as deep as those on the west (T.19N., R.2E.). Most wells in R.3E. are domestic supplies. These wells are generally less than 100 feet deep, and many are less than 50 feet deep. The shallowest wells tap the Steilacoom Gravel and/or Vashon till, but the majority of the wells probably penetrate through the till to the underlying advance outwash deposits. Many wells in R.2E. are also shallow and tap similar aquifers. However, this area has many more wells that are greater than 100 feet in depth. Most wells between 100 and 300 feet deep obtain water from Vashon advance outwash and/or the Colvos sand. Pre-Vashon aquifers provide water to the deepest (greater than 300 feet) wells. Most of the deep wells are relatively high-yield wells (greater than 300 gpm) that were drilled for public water supply.

Although most of the wells in the area were constructed for domestic supply, the region's greatest use of groundwater is for public supply. In the early 1960's, 33 wells and one spring provided an average of over 4.3 trillion gallons (13,200 acre-feet) per year to the 76,000 people served by the Lakewood, Fort Lewis, and McChord AFB systems (Walters and Kimmel, 1968). Griffin et al. (1962) estimated that



SOURCE: Walters and Kimmel. 1968.

Figure 10
WATER WELLS WITHIN A
5 MILE RADIUS OF MC CHORD AFB

recharge from precipitation on the Tacoma Upland ranges from 360,000 to 440,000 acre-feet per year, so groundwater withdrawals by the three areas amounted to about 3 percent of this annual recharge.

The water supply at McChord AFB is obtained entirely from groundwater. Sixteen wells are known to exist on the air base, but a number of these are no longer used. Table 2 summarizes pertinent information on these wells, and the locations of the wells are shown in Figure 11. Only one well, Golf Course Well 3, is less than 90 feet deep. This well is 35 feet deep and penetrates only the Steilacoom gravel. All other wells are believed to tap aquifers beneath the Vashon till.

3. Water Quality

Historically, overall surface water quality in Clover Creek has been good. Analytical water quality sampling conducted by USAF personnel showed levels for heavy metals to be low. Coliform counts have also been low. However, based on data from the 1960's (Littler, 1980), there has been a slight overall trend toward decreasing water quality, primarily due to increased urbanization along the creek drainage.

Spills of foaming agents, oil, and fuel have been the primary causes of USAF surface water quality impacts. Several complaints of foam on Lake Steilacoom have been compiled by the Washington State Department of Ecology. They were directly traced back to fire suppression system malfunctions at McChord AFB where the foam was washed into Clover Creek via storm drains. Other reports compiled since the early 1970's by the base bioenvironmental engineer's office have expressed concern over oil discharges into the creek through stormwater drains. These discharges were due to either poor oil-water

Table 2
SUMMARY OF WELLS ON McCHORD AFB

Well Name	Building Number	Well Depth (feet)	Ground Elev. (feet)	Casing Depth (feet)	Casing Diameter (inches)	Perforated Zones (feet)	Formation Screened	Date Completed	Remarks
North Well	711	200	300	195	12 170-181	145-150, 152-165,	Vashon Vashon	3-39	
South Well	782	298	300	292	12 264-278	140-153, 165-182,	Vashon Colvos/S.S.[1]	1-26-39	
East Well	190	550	300	500	16	201-210, 217-220, 245-250, 417-470, 481-490, 492-498	Colvos/S.S.[1] Colvos/S.S.[1] Colvos/S.S.[1]	6-43	
Holiday Park Well	251	97	320	80	6	-	-	4-54	Not used--capped off
SAGE Well 1	846	158	280	138	12	Screened 137-158	Vashon	8-9-56	Johnson 12" stainless steel screen
SAGE Well 2	847	250	280	207	6	35-69	Vashon	3-2-57	
Family Housing Well 1	5001	435	300	358	18,12	94-96, 138-140, 150-154, 220-254	Vashon, Vashon,Colvos/S.S.[1]	3-2-57	12" casing from 138' to 358'
Family Housing Well 2	5003	220	280	205	12	Screened 205-220	Colvos/S.S.[1]	6-1-59	
Family Housing Well 3	3410	216	280	197	12	Screened 197-216	Vashon, Colvos/S.S.[1]	-	
Signal Hill Well (Mars Station)	832	141	360	141	6	-	-	3-41	Originally hand dug to 57'; bailed clean in 8-52
Nursery Well	-	91	304	-	6	-	-	3-18-41	Originally hand dug to 40'
Roy Well	-	113	-	-	8	89-93	Vashon	7-50	Location unknown
Golf Course Well 1	-	280	280	270	-	123-150, 225-232	Vashon, Colvos/S.S.[1]	2-17-61	Abandoned
Golf Course Well 2	-	634	300	-	12	-	-	-	Abandoned
Golf Course Well 3	-	35	280	-	-	-	Steilacoom gravel	-	
Sanitarium Well	-	263	280	252	10,8	-	Colvos/S.S.[1]	1951(?)	8" casing from 136' to 263'

Note: All data supplied by McChord AFB. Ground elevations estimated from 20-foot contour maps except nursery well.

[1] Salmon Springs.

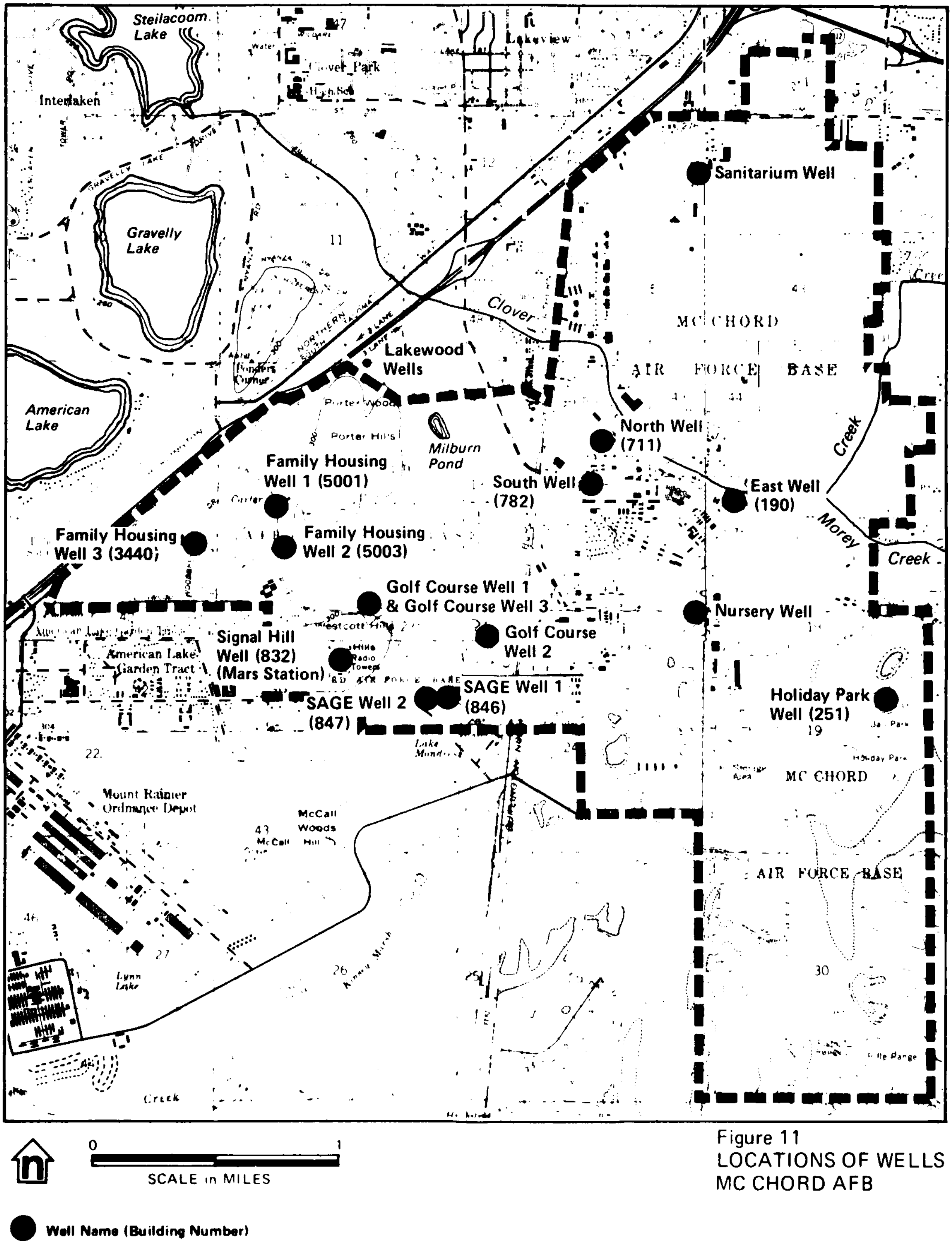


Figure 11
LOCATIONS OF WELLS
MC CHORD AFB

separator and skimmer maintenance or overloading of these systems. In addition, reports compiled in the 1960's referred to numerous oil slicks on Clover Creek and several fish kills in the late 1950's and early 1960's. Other sources of contamination discharge to Clover Creek from both upstream and downstream from McChord AFB.

Two Air Force reports in 1981 expressed concern over impacts from pipes draining into Clover Creek. A 10-inch vitrified clay (VC) pipe leading to Clover Creek from the vicinity of Building 745 (Site 62) has found to be discharging heavy metals including cadmium (0.329 mg/l), chromium (0.081 mg/l), copper (0.404 mg/l), and lead (2.078 mg/l). Another source, pipe No. 18, was found in 1981 to be discharging detectable quantities of chloroform (4.1 ug/l), methylene chloride (0.3 ug/l), 1,1,1-trichloroethane (16 ug/l), TCE (5.2 ug/l), and 1, 2 (trans) dichloroethylene (11.7 ug/l) to Clover Creek.

Trace amounts of pesticides (less than detection limits) have also been measured in Clover Creek. Water quality data collected in 1972 indicated trace amounts of alpha-BHC, lindane, diazinon, and aldrin present in the creek. It did not appear, however, that these pollutants were from runoff at McChord, because these compounds were initially detected at the inlet of Clover Creek to the base.

Limited sampling has been recently conducted at Milburn Pond located near the northwest boundary of the base (see Figure 3). Samples collected in the wet areas surrounding the Milburn Pond of surface water and in the bottom sediments revealed small quantities of TCE and 1, 2 (trans) dichloroethylene. Analyses for metals were generally below EPA allowances for drinking water. The only noteworthy exception

was two samples taken from the pond contained 487 and 123 mg/l of barium.

A number of factors influence groundwater quality in the Tacoma Upland and McChord AFB vicinity. Deep groundwater normally contains dissolved constituents that are indicative of the aquifer's geologic environment. Low flow rates result in long residence times, thus allowing the groundwater to approach chemical equilibrium with the minerals in the aquifer. Near McChord AFB, groundwater present beneath the Vashon till is predominantly a calcium bicarbonate type. Total dissolved solids are generally on the order of 100 mg/l, with calcium and magnesium accounting for about 70 percent of the total cations, and bicarbonate often accounting for more than 80 percent of the total anions (Walters and Kimmel 1968). The chemical character of groundwater in shallow aquifers--those above or in the Vashon till--is more likely to reflect the chemical makeup of its recharge source, which in this case is precipitation which has infiltrated the soil and percolated to the water table. More variability would be expected in the chemical constituents of these shallow groundwaters.

In the McChord AFB area, the Steilacoom Gravel aquifer is susceptible to contamination because it is shallow and overlain by a very permeable soil, the Spanaway gravelly sandy loam. The relatively impermeable Vashon till provides some natural protection for the underlying aquifers; however, the till is sometimes absent, leaving an open avenue for pollution from surface sources. Moreover, the deep aquifers receive recharge via slow percolation through the till, so the till does not necessarily provide complete natural protection to the underlying groundwater body.

Because of the intimate relationship between surface water and shallow groundwater, surface water quality has a significant effect on the quality of the shallow ground water and vice versa. Some surface water of the basin fails to meet water quality standards such as nitrates, phosphates, and bacteria. Shallow groundwater quality also indicates that contamination from septic tanks may be occurring in some areas. The Washington State Department of Ecology (1979) believes that the basin's "surface water system has reached, and in some cases exceeded, its ability to absorb and treat wastes." The result has been widespread fecal coliform contamination in many creeks, as well as high nitrate-nitrogen levels in almost all creeks. The DOE partially attributes the poor water quality to the large volume of septic tank effluent, not a result of base activities, that has been discharged to the shallow water system.

Nitrate-nitrogen, dissolved chloride, and phosphate levels in groundwater in the Chambers-Clover Creek basin are shown in Figures 12, 13, and 14, respectively. Although the groundwater samples were obtained from wells of varying depths, a pattern does emerge from the figures: nitrate-nitrogen and dissolved chloride levels are most elevated in the populated regions of the basin that are unsewered. This correlates with the use of septic tank and drainfield to provide for disposal of large quantities of sewage effluent that readily percolates through the permeable subsoils. This effluent is a potential source of nitrate-nitrogen and dissolved chloride. Littler et al. (1981) obtained historical data that indicated that the increasing basinwide levels for nitrate-nitrogen and dissolved chloride have corresponded to the expansion of the basin's populated areas. The elevated levels do not extend into McChord AFB, reflecting the fact that the base is sewered. The elevated phosphate levels shown in Figure 14 are centered in three regions in the basin, none of which

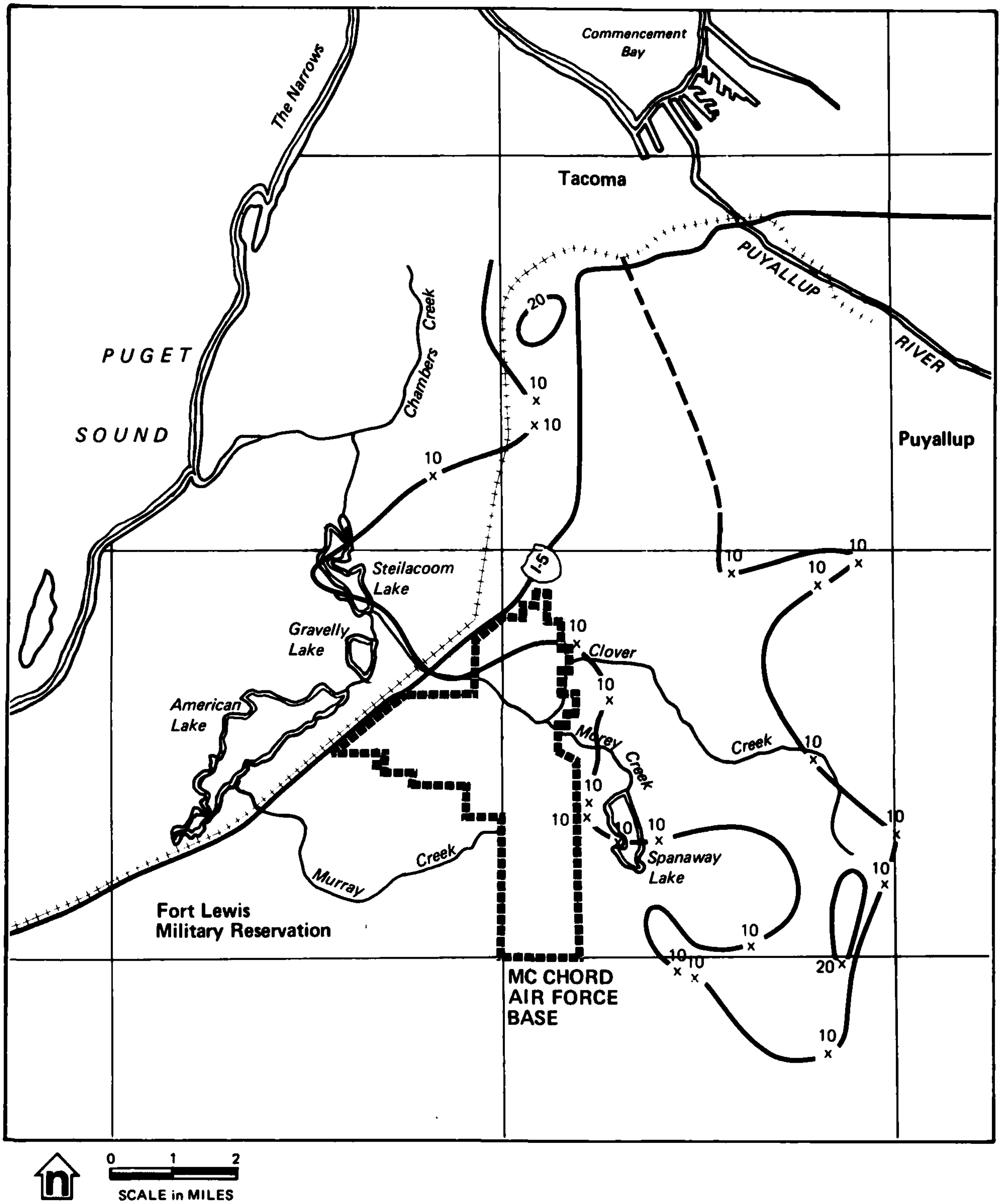


Figure 12
DISSOLVED CHLORIDE LEVELS (mg/l)
NOVEMBER 1980 THRU FEBRUARY 1981
MC CHORD AFB

SOURCE: Littler et al. 1981.

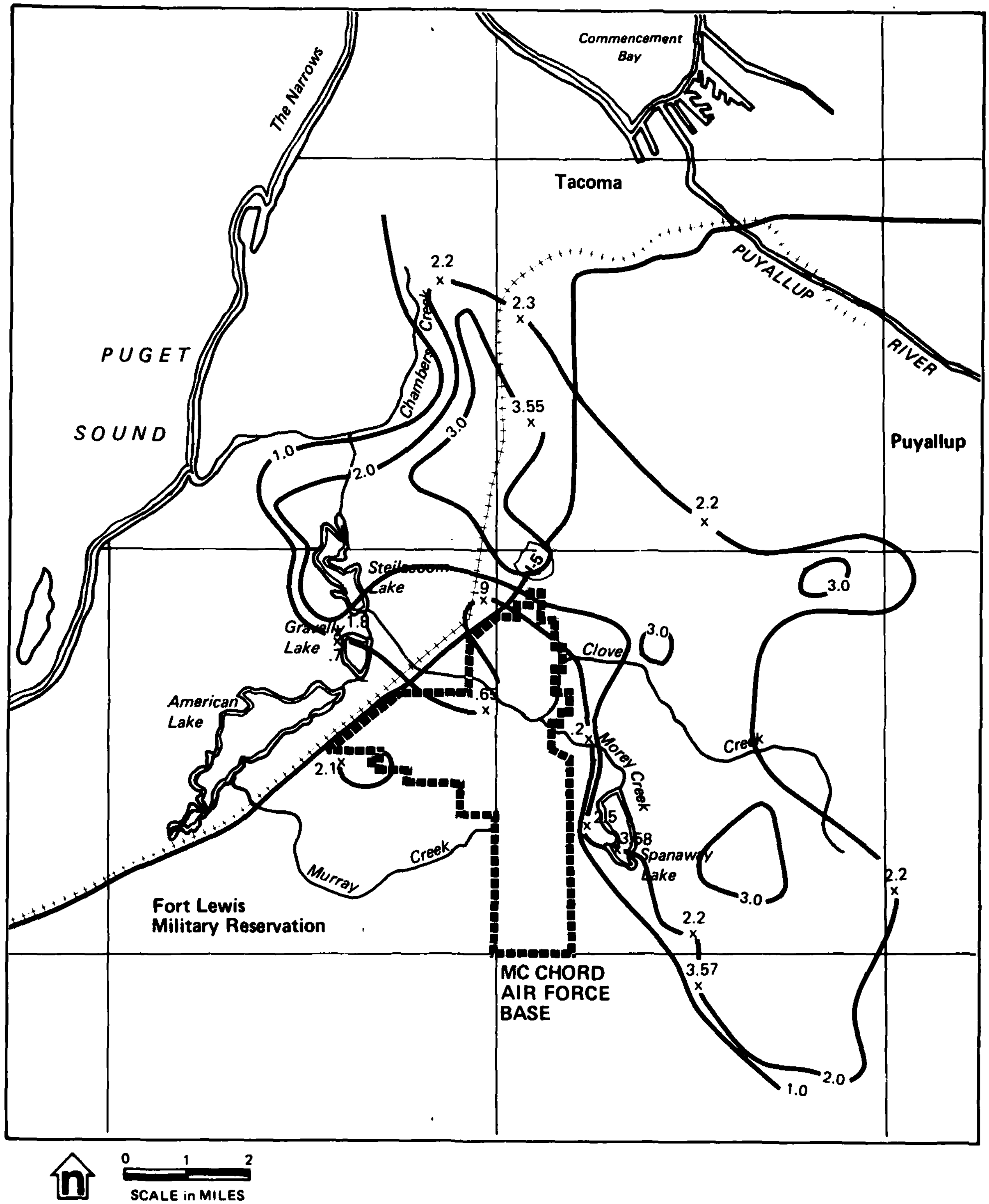
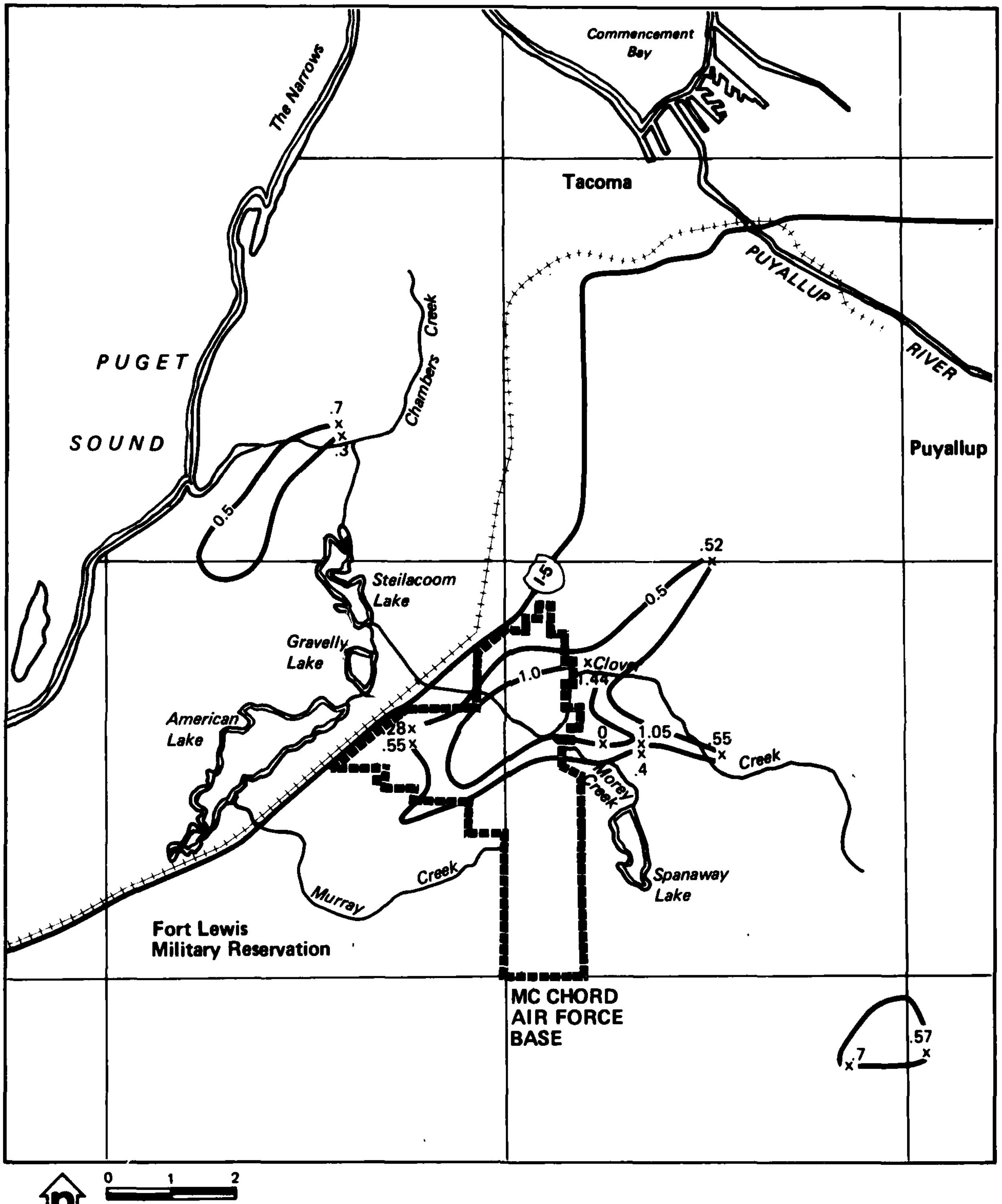


Figure 13
NITRATE-NITROGEN LEVELS (mg/l)
NOVEMBER 1980 THRU FEBRUARY 1981
MC CHORD AFB

SOURCE: Littler et al. 1981.



SOURCE: Littler et al. 1981.

Figure 14
PHOSPHATE LEVEL (mg/l)
NOVEMBER 1980 THRU FEBRUARY 1981
MC CHORD AFB

coincides closely with the areas showing elevated nitrate-nitrogen and dissolved chloride levels.

Localized areas of groundwater contamination undoubtedly exist in the Tacoma Uplands in addition to the widespread contamination described above. One such area was discovered in the summer of 1980, when organic solvents were found in Lakewood Wells H-1 and H-2. Water from H-2, the more polluted of the two wells, contained up to 101 ug/l of 1, 2 (trans) dichloroethylene, up to 20 ug/l of TCE, and up to 272 ug/l of PCE. Solvent concentrations in Well H-1 were about 10 to 15 percent of these values. The EPA is currently investigating this contamination and will soon release a report detailing their preliminary findings. Many wells in the area, including most of the McChord AFB wells, have been sampled and tested for various purgeable halocarbons. Four of the McChord wells showed more than a trace of volatile hydrocarbons. The wells have been sampled a number of times, and the results of these analyses are summarized below.

> North and South Wells--Low levels of TCE (1 to 5.3 ug/l) have been detected in both wells during each sampling.
>
> Family Housing Well 3--A chloroform level of 34 ug/l was detected in the May 7, 1981 sampling. Three other samplings detected no chloroform.
>
> Signal Hill Well (Mars Station)--Low levels of chloroform (1.8 to 9 ug/l), bromodichloromethane (1.2 to 2.4 ug/l), and dibromochloromethane (1.3 ug/l) have been detected.

The source of the organic constituents is unknown at this time.

D. ENVIRONMENTALLY SENSITIVE CONDITIONS

1. Habitat

The grounds of McChord AFB include habitats for both aquatic and terrestrial wildlife species. Aquatic habitats include Clover Creek, which runs east to west through the base, and various ponds and wetland areas located in the east, south, and west portions of the base. Terrestrial habitats include Douglas fir forests, riparian vegetation (found along the banks of the creek and ponds listed above), grassland and scotch broom meadows, and landscaped grounds such as the Whispering Firs Golf Course.

Clover Creek is inhabited by native cutthroat trout and was stocked with rainbow trout upstream of the base during a sport fishery program conducted from 1962 to 1979. A downstream dam on Steilacoom Lake blocks anadromous fish from inhabiting Clover Creek; however, a large Washington State Department of Game steelhead hatchery and a smaller satellite hatchery are located adjacent to Chambers Creek. Clover Creek flows into Steilacoom Lake, which discharges via Chambers Creek to Puget Sound. This hatchery is a major producer of steelhead eggs for the Department of Game's steelhead program. The hatchery and its satellite use springs as primary water sources, but have water rights for a small portion of Chambers Creek. Chambers Creek water would be used for water supply should funding become available for an expansion project in the smaller satellite hatchery.

The ponds on base include Morey Pond, Milburn Pond, Carter Lake, and small ponds around the golf course.

Carter Lake and Morey Pond have been stocked with game fish during sport fishery programs. Carter Lake was stocked with rainbow trout from 1962 to 1979. This lake is very shallow (4.5 feet). Because of elevated water temperature and overly abundant aquatic vegetation, the lake's ability to support game fish is poor. In 1979 Morey Pond was enlarged through dredging.

The area is being prepared for recreational use by the development of an adjacent picnic area and by stocking the pond with bass and possibly crappie and bluegill. The golf course ponds have been noted to contain bass but no fishing program is in effect.

Aquatic habitats on base which are not maintained are Milburn Pond, Talb Marsh, Hassett Marsh, and several areas around the ammunition storage (800) area. Many of these areas are freshwater marshes that provide feeding, cover, and reproduction habitat for a variety of species. Milburn Pond, located west of the west entrance, and Talb Marsh, located in the approach to Runway 34, once intermittently filled with water, have been altered by base disposal activities. These activities have reduced the permeability of the soils, causing standing water to occur year-round. The proximity of Talb Marsh to the runway reduces its usefulness for wildlife. Milburn Pond is relatively more remote and provides some wildlife habitat. Each of these areas contains not only resident species of birds, mammals, reptiles, and amphibians but also hosts migrant birds and waterfowl moving along the Pacific Flyway in the spring and fall.

Waterfowl regularly using these aquatic habitats include mallard, American widgeon, bufflehead, Canada

goose, and wood duck. There is an ongoing program to build wood duck nesting boxes around Carter Lake.

Standing water was also found in the bottom of a landfill site near Holiday Park on the eastern border of the base (Site 13) and at the landfill site south of the SAGE building (Site 6). The ponded water in the landfill near Holiday Park was of noticeably poor quality while that at the landfill near SAGE contained clear water and some growth of filamentous green algae. The use of the water by wildlife is probably small due to the abundance of other available water in the vicinity.

The terrestrial habitats at McChord AFB are used in several different ways. The Douglas fir forests are managed for timber production. Regular cutting and planting activities have occurred around the base, including planting of trees over old disposal sites. The grasslands in the south and east portions of the base have been stocked with upland game birds for hunting programs. The program has been stopped in recent years because of a large predatory coyote population. Large quail populations are still noted around the SAGE buildings. A small deer herd is reported to inhabit the densely vegetated western portion of the base.

2. Endangered or Sensitive Species

Several state and/or federally designated sensitive species occur in the vicinity of McChord AFB (Table 3). Two species have been sited on base, the bald eagle (federally designated threatened, state designated sensitive) and the western gray squirrel (state designated concern) (refer to Appendix I for explanation).

Table 3
PROTECTED SPECIES POTENTIALLY OCCURRING ON MCCHORD AFB

Species: Common Name	Species: Scientific Name	Status[a]: Federal	Status[a]: State	Reference
Animal				
Olympic Mud-Minnow	Novumbra hubbsi		SS	1
Sharp-Tailed Snake	Contia tenuis		SC	2
Barn Owl	Tyto alba		SC	2
Spotted Owl	Strix occidentalis		SS	1
Bald Eagle	Haliaeetus leucocephalus	FT	SS	1,2
Peregrine Falcon	Falco peregrinus anatum	FE	SE	1
Western Gray Squirrel	Sciurus griseus		SC	1,2
Lake Chub	Couesius plumbeus		SC	2
Rubber Boa	Charina bottae		SC	2
Western Bluebird	Sialia mexicana		SC	2
Northwestern Salamander	Ambystoma gracile		SC	2
Western Pond Turtle	Clemmys marmorata		SS	2
Plant				
Aster	Asteri curtus	FC1	PT	2
Bog Clubmoss	Lycopodium inundatum		PT	2
Spirea	Spiraea douglasii Ledum		PT	2
Trillium	Trillium albidium		PT	2
Pink fawn-lily	Erythronium revolutum		PS	2

[a]See Appendix [illegible].

Note: Reference [illegible]:
1. Tab. A-[illegible].
2. Nat[illegible] Heritage Data System, 1982.

A population of western gray squirrel is thriving on the base golf course. Small concentrations of bald eagles (10 to 70 individuals) are reported to occur to the southwest of the base where a known breeding site is located. Disposal activities on base do not appear to be detrimental to the gray squirrel. No contaminate-related impact to the local bald eagle population has been reported.

Aquatic species designated as sensitive include Olympic mud-minnow, lake chub, northwestern salamander, and western pond turtle. These aquatic species are reported occurring primarily in the marshes and ponds south and east of base boundaries. These species could occur in the aquatic habitats available on base including Morey and Milburn Ponds and Clover Creek.

Nonaquatic species that could occur on base include the sharp-tailed snake, rubber boa, western bluebird, barn owl, spotted owl, and peregrine falcon. The peregrine falcon (state and federally designated endangered) is noted only as a potentially occurring species. Natural Heritage Data System (1982) does not record any confirmed or unconfirmed occurrence of this species in the vicinity of McChord AFB.

Disposal activities and recreational management programs on base have increased the amount of aquatic habitat available. This increase in habitat may be beneficial to some sensitive species. The impact of industrial waste that may or have been introduced into these pond systems or Clover Creek is unknown other than as addressed in the next section.

3. Stress

No studies have been conducted to determine if any environmental stress is occurring in on-base aquatic habitat areas. However, a cursory overview detected no obvious signs of stress in on-base aquatic habitats.

Vegetational stress was noted during the on-site visit in a small grassland and scotch broom meadow in a depression northwest of the 318th FIS refueling area (Site 50). During on-site field studies a small quantity of what appeared to be JP-4 was seen flowing into this depression. Though not considered as environmentally sensitive, the vegetation in the bottom of this depression and along the sides of the drainage ditch was dead. Similar, though not as extensive, vegetational stress was noted in the storm drainage ditches to the south of the civil engineering yard, to the west of the 318th area, and downstream of Skimmer 1 (behind Building 1150).

IV. FINDINGS

IV. FINDINGS

A. ACTIVITY REVIEW

1. Summary of Industrial Waste Disposal Practices

The quantities of waste oil, fuels, solvents, and cleaners generated by McChord AFB are relatively small in comparison to those bases having significant aircraft overhaul and rework missions. Currently, the quantity of industrial wastes produced is approximately 80,000 gallons per year (excluding contaminated JP-4). The overwhelming majority of these wastes are disposed of off base through contract haulers and disposal facilities.

Historically, the quantity of industrial wastes generated each year have probably remained about the same. Though there have been occasional short-term fluctuations, most reports indicated a relatively constant level of industrial activity at McChord AFB.

Industrial operations at McChord AFB have been in operation since 1939. Major industrial operations include vehicle maintenance shops, the plating shop, jet engine shops, jet engine test cells, fuel system repair shops, the pneudraulics shop, wheel and tire shops, corrosion control shops, AGE shops, and the auto hobby shop. These industrial operations generate varying quantities of waste oil, waste hydraulic fluid, fuels, solvents, and cleaning compounds.

Standard disposal practices for these wastes have in the past included the following options:

- o Dry wells or leaching/soakage pits
- o Burning trenches

- Fire training areas
- Storm drains
- On-site landfills
- Off-site Pierce County landfills
- Sanitary sewer

The timings and types of disposal methods varied widely, depending on the source of the wastes. The details are provided in the following sections. In general, most wastes have been disposed of off base since approximately 1960 through contract removal, the storm drain, or the saintary sewer system. Significant use of leaching pits and storm drains discharging to Clover Creek continued until the early 1970's.

2. Industrial Operations

The industrial operations at McChord AFB are primarily involved in the routein maintenance of assigned C-130, C-141, F-106, and T-33 aircraft. A review of base records and interviews with past and present base employees resulted in the identification of those industrual operations where the majority of industrial chemicals are handled and hazardous wastes are generated. Table 4 summarizes the major industrial operations and includes the estimated quantities of mateirals used and wastes generated, as well as the past and present disposal practices of these wastes. Appendix J contains a list of minor industrial operations that were evaluated but determined not to be significant sources of hazardous wastes or potential contamination due to past waste disposal practices. Descriptions of the major industrial activities are included in the following paragraphs.

Table 4
MAJOR INDUSTRIAL OPERATIONS SUMMARY
McCHORD AFB

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method (1940–1980)
62 FMS NDI	Hangar 2/1975-82 Hangar 1/1939-75	Emulsifier Developer Fixer Zyglo	2000 gpy	1500 gpy	dry well; dry well or sanitary sewer; sanitary sewer
		Trichloroethane Perchloroethylene PD-680 Kerosene TCE	600 gpy - - 600 gpy -	300 gpy - - 600 gpy -	on-base POL disposal; contract removal or sanitary sewer; sanitar sewer; contract removal
Welding/ Electroplating	745/1953-82 Hangar 2/1951-53	Sodium Cyanide Cadmium Oxide	25 lb/yr 10 lb/yr	300 gpy -	contract removal
		Acids MEK TCE PD-680	200 gpy - 25 gpy -	200 gpy - - -	O/W separator and soakage pit; contract removal
Jet Engine Shop	745A/1953-82 Hangar 1/1950-68	MEK PD-680 Carbon Remover Ketone JP-4 Hot Turco Hydraulic fluid	12 gpy 300 gpy 25 gpy 13 gpy - 60 gpy -	- 300 gpy 25 gpy - - 60 gpy -	on-base POL disposal; O/W separator and wash rack leach pit; contract removal & sanitary sewer
Jet Engine Test Cell	792/1967-82 789/1958-1967 ?/prior to 1958	MEK PD-680 Ketone JP-4 Hydraulic Fluid Oil	350 gpy 600 gpy 15 gpy - 250 gpy 1000 gpy	- - - - 250 gpy 1000 gpy	dry well and contract removal; sanitary sewer; contract removal
Pneudraulics	Hangar 2	Trichloroethane TCE Hot Turco PD-680 Hydraulic fluid	400 gpy 15 gpy 120 gpy 1800 gpy 1200 gpy	100 gpy - 120 gpy 600 gpy 1200 gpy	on-base POL disposal; contract removal

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. nc./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
62 FMS (cont.)					
Wheel and Tire	Hangar 2	Paint Remover	350 gpy	350 gpy	sanitary sewer; contract removal
	218/1973-82	PD-680	300 gpy	300 gpy	on-base POL disposal; contract removal
	Hangar 3/1950-72	Thinner	300 gpy	300 gpy	
		Oil 55 gpy	55 gpy	–	
Fuel Systems Repair	1175/1967-82	MEK	350 gpy	52000 gpy	on-base POL disposal; contract removal
	1164/1958-67	PD-680	600 gpy		
	?/prior to 1958	Trichloroethane	350 gpy		
		Toluene	50 gpy		
		JP-4	-		
Corrosion Control	Hangar 2	MEK	850 gpy	-	POL on-base disposal; POL contract removal; Other material to landfill or storm drain until early 1970's
		Paint Removers	310 gpy	310 gpy	
		Toluene	300 gpy	-	
		PD-680	60 gpy	60 gpy	
		Thinner	600 gpy	-	
		Dimethyl foramide	60 gpy	-	
		Paint	-	-	
		Lacquer	-	-	
		Aliphatic Naphtha	25 gpy	-	
62 AGE Maintenance	1169 & 1170/1961-82	PD-680	100 gpy	100 gpy	on-base POL disposal; contract removal
	1208/1959-61	Engine Oil	900 gpy	1600 gpy	
	Hangar 5/1957-59	Synthetic Oil	700 gpy		
	?/prior 1957	Hydraulic Fluid	150 gpy	150 gpy	
		MOGAS/JP-4	200 gpy	200 gpy	
		Cleaning Compound	1800 gpy	1800 gpy	storm drain; O/W separator to storm drain
AGE Paint Shop	1167	MEK	200 gpy	-	on-base POL disposal; contract removal
		PD-680	60 gpy	-	
		Toluene	250 gpy	-	
		Paints	-	-	
		Primers	300 gpy	-	
		Naphtha	100 gpy	-	
		Paint Thinner	250 gpy	-	
		Paint Sludge	-	25 gpy	
Battery Shop	1119/1967-82 Hangar 2/ prior 1967	Sulfuric Acid	Varies	-	acid dry well; sanitary sewer

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
62 FMS (cont.)					
Environmental Systems		Trichloro-fluoromethane	60 gpy	-	contract removal
		PD-680	60 gpy	-	
		Trichloroethane	300 gpy	-	
62 CES					
Paint Shop	536/1977 541/prior to 1977	Thinner	600-3000 gpy	-	landfill or groundwater recharge pit; contract removal
		Paint Remover	15 gpy	-	
		Paint	6000 gpy	-	
		Pigment	225 gpy	-	
		Turpentine	10 gpy	-	
		MEK	4 gpy	consumed	
Steam Plant	734	PD-680	60-165 gpy	-	on-base POL disposal; contract removal
		Mercury	10 lb/yr	10 lb/yr	contract removal
Entomology	532	"Ficam"	10-30 lb/yr	consumed	rinsed container to dumpster
		"Dursban"	2-5 gpy		
		"Warfarin"	50-100 lb/yr		
		Diazinon	1200 gpy		
		Malathion	15-25 gpy		
		"Baygon"	6 gpy		
		"Sevin"	15 lb/yr		
		2,4-D	55 gpy		
		DDT	-		
		A-vitrol	-		
		Rinsewater	-	18 gpy	surface damage; contract removal
Roads and Grounds	532	Herbicide		consumed	triple-rinsed container to dumpster
		"Weed master"	25 gpy		
		"Urox Granular"	5000 lb/yr		
		2,4-D	150 gpy		
		"Urox Liquid"	50 gpy		
		"Dichlobenil"	500 lb/yr		
		"Pramitol Pellet"	500 lb/yr		
		Fungicide			
		"Fore"	400 lb/yr		
		"Chip Co"	250 lb/yr		
		"Caddy"	200 gal/yr		

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
62 CES (cont.)					
Fire Department	6	AFFF	2400 gpy	2400 gpy	storm drain or ground water; O/W separator to sanitary sewer
		Protein Foam	2400 gpy	2400 gpy	
		Bromodichloro-fluoromethane	2000 lb/yr	2000 lb/yr	
		PD-680	55 gpy	55 gpy	
		Bromo-chloromethane	40 gpy	40 gpy	
62 TRANS					
Vehicle Maintenance					
Special Purpose	724	Oil	2700 gpy	2700 gpy	on-base POL disposal; POL contract removal; O/W separator to storm drainage or dry well
General Purpose	778	PD-680	350 gpy	300 gpy	
Tire Shop	722	Hydraulic fluid	-	-	
Body & Paint	779	Paint	-	-	
Mobile Maintenance	718	Thinner	240 gpy	-	
463L Repair	718	Sulfuric Acid	-	150 gpy	
		MOGAS	-	-	
318th FIS					
Armament Systems (Weapons Release)	328	PD-680	-	150 gpy	contract removal
		Zinc Chromate Primer	-	-	
AIR Maintenance (Weapons Storage)	351	TCE	2 gpy	-	on-base POL disposal; contr..t removal
		MEK	3 gpy	-	
		PD-680	-	-	
		Toluene	12 gpy	-	
		Trichloroethane	3 gpy	-	
Missile Maintenance	307	Trichloroethane	12 gpy	consumed	wipe rags to landfill
		MEK	12 gpy	consumed	
		Toluene	12 gpy	consumed	
Electric Shop	304	Potassium Hydroxide	24 gpy	-	sanitary sewer

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
318 FIS (cont.)					
Fuel Systems	342	MEK	18 gpy	-	groundwater recharge pit or on-site POL disposal; groundwater recharge pit or contract removal
		JP-4	-	-	
		Toluene	-	-	
		Naphtha	-	-	
AGE	342/1978-82 23/prior to 1978	Oil	1600 gpy	1600 gpy	on-base POL disposal; contract removal
		MOGAS	-	-	
		Hydraulic Fluid	100 gpy	100 gpy	
		TCE	20 gpy	20 gpy	oil and grease trap to storm drainage; oil skimmer to storm drainage; O/W separator to leach pit
		PD-680	500 gpy	500 gpy	
		Cleaning Compound	660 gpy	660 gpy	
Avionics	341	MEK	60 gpy	-	on-base POL disposal and storm drainage; contract removal and storm drainage
		PD-680	60 gpy	-	
		Toluene	24 gpy	-	
		Hydraulic Fluid	900 gpy	-	
		Trichloroethane	-	-	
		Radiation Source Tubes	3/yr	-	
Pneudraulics	304/1974-1982 301/prior to 1974	PD-680	20 gpy	20 gpy	on-base POL disposal and storm drainage; contract removal and storm drainage
		Hydraulic Fluid	600 gpy	60 gpy	
		Freon	12 gpy	consumed	
Support Section	301	PD-680	180 gpy	180 gpy	on-base POL disposal and storm drainage; contract removal and storm drainage
		MEK	12 gpy	12 gpy	
		Hydraulic Fluid	36 gpy	36 gpy	
Corrosion Control	341	Thinners (MEK, Tuoluene)	300 gpy	300 gpy	on-base POL disposal; contract removal
		Paints (lacquers, enamel, poly-urethane, zinc chromate primer)	350 gpy		

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
<u>318 FIS (cont.)</u> Corrosion Control (cont.)		Strippers PD-680	300 gpy 600 gpy	300 gpy 600 gpy	O/W separator to leach pit; O/W separator to sanitary sewer
Jet Engine Shop	745/1959-82 Hangar 1/prior to 1953	Oil JP-4 PD-680 MEK Hydraulic Fluid	850 gpy 600 gpy 600 gpy - 12 gpy	850 gpy 600 gpy 600 gpy - 12 gpy	on-base POL disposal; O/W separator & wash rack leach pit; contract removal & sanitary sewer
Jet Engine Test Cell	789	PD-680 Trichloroethane Carbon Remover JP-4 Cleaning Compound	600 gpy - 600 gpy - 400 gpy	- - 600 gpy - 400 gpy	on-base POL disposal and dry well; contract removal and dry well
T-33 Flight	304/1969-82 Hangars 1 and 2/ prior to 1969	PD-680 TCE MEK Hydraulic Fluid Oils JP-4	24 gpy 6-60 gpy 6-60 gpy - - -	- - - - - -	on-base POL disposal; contract removal; contract removal & surface drainage
<u>62 ABG</u> Base Reproduction	100	Ferrocyanide/ Hydrogen Cyanide (Electrostatic Solution) Methylene Chloride (Deglazing Solution) PCE	120 gpy 12 gpy -	35 gpy consumed -	landfill

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
62 ABG (cont.)					
Auto Hobby Shop	1120/1972-82 835/1966-71 ?/1952-66 223/prior to 1952	Kerosene Solvent (Gunk) Oils PD-680	300 gpy 24 gpy - 240 gpy	300 gpy 24 gpy - 240 gpy	on-base POL disposal; contract removal
Base Photo Lab	12	Developer Fixer	- -	60 gpy -	silver recovery with effluent to sanitary sewer
25 ADS					
SAGE Power Plant	853	Carbon Remover PD-680 Caustic Soda	24 gpy 48 gpy 180 lb/yr	- - -	on-base POL disposal; contract removal or landfill; contract removal
Equipment Cooling Maintenance		TCE Trichloroethane	60 gpy 6 gpy	consumed consumed	
62 OMS					
Transit Maintenance	Hangar 2	Oil	-	-	
Flight Line	1173	JP-4 Naphtha	- 150 gpy	- -	on-base POL disposal; contract removal
62 AMS					
Instrument Shop	1119	Mercury TCE	30 lb/yr 24 can/yr	30 lb/yr consumed	contract removal
Communications	1119	TCE	24 can/yr	consumed	
PMEL	707	Mercury	60 lb/yr	60 lb/yr	contract removal

See notes at end of table for explanation of symbols and additional information.

Table 4 - Continued

Shop Name	Location (bldg. no./date)	Material	Material Usage	Material Waste Quantity	Treatment/Storage/Disposal Method 1940 1950 1960 1970 1980
Contractor Wash Rack	1178	PD-680 Cleaning Compound	35000 gpy 35000 gpy	35000 gpy 35000 gpy	O/W separator to wash rack leach pit; O/W skimmer to storm drains
USAF Clinic Laboratory	160	Liquid phenol Formaldehyde Acetone Xylene	25 lbs/yr 6 gpy 3 gpy 3 gpy	- - - -	sanitary sewer
Radiology	160	Developer Fixer	18 gpy 18 gpy	- -	sanitary sewer
Medical Maintenance and Supply	163	Trichloroethane Mercury Developer Fixer	3 gpy 1 lb/yr 40 gpy 60 gpy	- - - -	consumed or contract removal

Notes:
1. "-" under "Material Usage" or "Material Waste Quantity" means quantities are unknown.
2. Material usage and material waste quantity are based on most current information available.
3. TCE and perchloroethylene are not currently used on base.
4. "------" means estimated period of usage.

a. Non-Destructive Inspection (NDI)

The NDI shop is operated by the 62nd FMS. Waste materials generated included emulsifier, developer, fixer, Zyglo, trichloroethane, PCE, PD-680, kerosene, and TCE.

Until 1968 waste emulsifier, developer, fixer, and Zyglo were disposed in a dry well located on the west side of Hangar 1 (Site 57). Some time after 1968 the NDI shopbegan the current practice of disposing these wastes into the sanitary sewer. Developer and fixer go through silver recovery first. Some kerosene may have also been disposed of in the sanitary sewer.

Trichloroethane, PCE, PD-680, kerosene, and TCE were disposed of by burning in base landfills, burning in fire training areas, aplying to roads for dust control, discharge to a dry well, or by contract removal until about 1960. Contract removal using drums or bowsers and centralized collection tanks became the primary disposal method after 1960. Some of these wastes especially kerosene, may also have been discharged into the sanitary sewer.

b. Engine Shops

Three engine shops at McChord AFB perform engine maintenance: the 62nd FMS jet engine shop, the 318th FIS jet engine shop, and the 318th FIS T-33 flight shop.

Currently, the primary wastes generated by these shops are contaminated JP-4, solvents, and POL. These materials have been recovered in drums or bowsers and sold through DPDO to a contractor for recycling as the primary means of disposal since 1972. Between 1951 and 1972, the 62nd and 318th jet engine shops disposed of some of these materials into the oil-water separator and leach pit system located near the

62nd washrack on D ramp (Site 54). Until 1972 these wastes were also burned, used for dust control, or sold to a contractor for recycling or landfill.

The 318th jet engine shop used approximately 150 gpy of carbon tetrachloride during the period from 1940 until 1952. Wastes were reported to have been either dumped on the ground or into the drains. Some of this undoubtedly went into Clover Creek through Hangar 1 storm drains. From 1963 until 1968 the 318th used an estimated 25 to 50 gallons per month of TCE. While most of this evaporated, some of it went into the drains to the oil-water separator near the 62nd aircraft washrack (Site 54).

In the late 1940's the 62nd engine shop had cleaning tanks located in Hangar 1. They used about 200 gpy of trichloroethane and 400 gpy of carbon remover. Hot turco was also used. Some of these materials were reportedly discharged into the hangar floor drains and hence into Clover Creek.

c. Welding/Electroplating

The welding and electroplating shop is operated by the 62nd FMS. The primary wastes generated are sodium cyanide and cadmium oxide plating solutions, MEK, TCE, and PD-680. These wastes have been disposed of in drums for contract removal since 1970.

The first major cadmium plating operation at McChord AFB was begun in Building 745 in 1955. This system reportedly used five 300-gallon plating, cleaning and rinse tanks. These tanks were drained once a year to an acid dry well along the banks of Clover Creek (Site 61) until 1960 and from that point on to the industrial waste treatment facility located near the 62nd washrack on D ramp. Other materials, such as TCE, MEK, and PD-680, were disposed of in a soakage pit

located half-way between where Building 745 is today and Clover Creek. These practices stopped when contract removal began in 1970. Plating washes were also reportedly dumped on the ground between Building 745 and Clover Creek (Site 62). Elevated surface soil levels of cadmium, lead, and zinc (384, 531, and 180 mg/kg respectively) have been measured in a recent sampling and analysis program.

For 2 to 3 years after 1970, plating solutions were removed by contract for off-base disposal. Following this period these materials were handled by DPDO.

The plating operation was scaled down to its present size in the early 1970's (four 10-gallon tanks). When this occurred, the quantity of plating solutions and rinse water requiring disposal decreased to 300 gpy.

d. Jet Engine Test Cells

Jet engines are tested by the 62nd FMS and 318th FIS. Currently, they are using the test cells located at Buildings 789 and 792. The primary wastes generated by these operations are JP-4, MEK, PD-680, trichloroethane, carbon remover, and cleaning compound. These materials have always been disposed of either by discharging in to a dry well located near Building 789 (Site 60) or storing in drums for contract removal. Some waste POL was disposed of by the 318th from the late 1950's until about 1960 either by burning or using for dust control.

e. Pneudraulics

Pneudraulics shops are operated by the 62nd FMS and 318th FIS. Wastes generated by these shops include PD-680, hydraulic fluid, TCE, trichloroethane, hot turco, and freon.

These materials have been recovered in drums or bowsers for contract removal since 1960. Inspection of the storm drainage system near Building 304 (Site 51) by CH2M HILL personnel indicates that some of the 318th waste materials are also being carried off with stormwater drainage. Prior to 1960, other disposal methods included burning at base landfills or fire training areas, spreading for dust control, and discharge to a dry well.

f. Fuel Systems Repair

Fuel systems repair is conducted by both the 62nd FMS and the 318th FIS. Wastes generated by these shops include JP-4, PD-680, MEK, toluene, trichloroethane, and naphtha. The 62nd FMS has the larger operation, producing approximately 52,000 gpy of waste materials, the vast majority of which is contaminated JP-4. Before 1960 shop wastes were primarily disposed of by burning, with some use for dust control. Some was also removed by contract for disposal by landfilling or recycling. After 1960, the majority of these wastes have been recovered in drums or bowsers for contract removal.

Waste JP-4 and POL have been noted in stormwater drainage to a groundwater recharge depression located west of the defueling area at Building 342 (Site 50). Fuel spills probably account for most of the contamination. It appears that this area has been used for disposal since the mid-1950's.

g. Corrosion Control

Corrosion control activities at McChord AFB are conducted by the 62nd FMS, the 318th FIS and an independent contractor. Waste materials generated include PD-680, MEK, thinners, paint strippers, toluene, waste paint, and cleaning compounds.

Prior to 1960, most of these materials were disposed of to leaching pits and storm drains to Clover Creek or by burning, with some used for dust control. Some was removed by contract for disposal by landfilling or recycling. After 1960, POL materials were primarily recovered in drums or bowsers for contract removal.

Disposal methods practiced for aircraft cleaning included wasting PD-680 and strippers to the industrial treatment facility at the 62nd washrack on D ramp (Site 54).

Before 1970, effluent from the industrial treatment facility went to leach pits (Site 54). After 1970, effluent from the industrial treatment facility was discharged to the Ft. Lewis sanitary sewer.

Corrosion control activities conducted by the contractor mostly involve aircraft washdown. PD-680 and alkaline water base cleaning compounds are washed into floor drains. From there, the wastes went to the industrial treatment facility at the 62nd washrack on D ramp (Site 54) until the early 1970's when an oil skimmer was installed and effluent piped to the sanitary sewer. In addition, the contractor washes down aircraft at various locations scattered over "C" ramp. This material is then washed to the storm drain and through skimmers 1 and 2 prior to discharge to Clover Creek at Site 53 and near Building 1167.

h. Wheel and Tire

The base wheel and tire shop is operated by the 62nd FMS. Waste materials generated include PD-680, paint remover, thinner, and oil.

Prior to 1980, paint removers used in the wheel stripping tank were drained via the floor drain to the sanitary sewer. From 1980 until the present, waste paint remover has been stored in drums for contract removal.

Other materials, such as PD-680, thinner, and oil, were disposed of by burning in landfills or fire training areas, applying for dust control, or some contract removal until 1960. After 1960, these materials primarily were drummed or stored in bowsers and sold for contract removal by DPDO. It was reported that in the 1950's significant quantities of solvents were dumped down the drains probably leading either to a dry well (Site 57) or to Clover Creek.

i. Paint Shop

The primary paint shop is operated by the 62nd FMS AGE. Waste materials generated include MEK, PD-680, toluene, naphtha, thinner, excess paints, and paint sludges. Until 1960 these materials were probably disposed of by burning in landfills or fire training areas, applying to roads for dust control, or limited contract removal. Since 1960, these wastes have primarily been recovered in drums and disposed of by contract removal.

During the 1950's and 1960's, the AGE paint shop was reportedly the second largest waste producer on the base, after the engine shops. During this time significant quantities of solvents were used. Quantities used or disposed of are, however, unavailable. Paint sludges may have been dumped in base landfills.

The 62nd operated a paint spray booth in Hangar 2 in 1974. Approximately 500 gallons of lacquer and 125 gallons of

enamel were consumed in this shop annually. The water wash drain discharged directly into the sanitary sewer.

j. Fire Department

The base fire department is operated by the 62nd CES. Wastes generated are primarily POL residues and fire extinguishing products such as AFFF, protein foam, bromodichlorofluoromethane, bromochloromethane. These materials have most often been used during fire training exercises; however, some spills have also been recorded.

In the past, disposal was usually through evaporation, runoff through storm drains, or percolation into the soil. At the current fire training area runoff after an exercise is directed through an oil-water separator to the sanitary sewer. See Section B of this chapter for additional information on fire training areas.

k. AGE Maintenance

AGE maintenance activities are conducted by the 62nd FMS and 318th FIS. Wastes generated by these shops include engine oil, synthetic oil, MOGAS, JP-4, PD-680, cleaning compound, hydraulic fluid, and some TCE.

Wastes from the 62nd FMS squadron were disposed of by burning in landfills and fire training areas, applying to roads for dust control, or limited contract removal until 1960. After 1960, wastes generated by the 62nd were primarily recovered in bowsers or drums for contract removal.

Waste oil, MOGAS, and hydraulic fluid from the 318th received the same treatment as wastes from the 62nd. Until 1978, solvents such as TCE, PD-680, and cleaning compound were

dischared to drains leading first to an oil-water separator and then to Clover Creek. Any floating oils collected were probably disposed of by the methods previously discussed for other POL wastes. A 1968 report indicated that the oil-water separator used by the 318th FIS squadron was partially filled with sand and was discharging most of the floating oils directly to Clover Creek.

In 1978, the 318th moved to Building 342 and began using the oil-water separator and leach pit system located there. Corrosion control work was also performed in this area from 1978 to 1981. Waste oils and paint stripping waste are collected in a storage tank adjoining the oil-water separator for later contract removal. A number of spills have been recorded in this area (Site 49).

l. Entomology, Roads, and Grounds

Entomology and roads and ground activities are conducted by the 62nd CES. These shops use large quantities of pesticides, including herbicides and fungicides. Most of these products are consumed during application. Waste containers are triple rinsed and disposed of in base landfills. The rinsate is used again in the applicator. In the past, sinks associated with industrial shops in the CE yard (not sanitary facilities) drained to the storm drain system. It is possible that rinsate may have reached Site 36 in the past.

m. Vehicle Maintenance

Major automotive and truck maintenance is conducted by the 62nd TRANS. There are several shops in this squadron. Wastes produced include oil, hydraulic fluid, PD-680, paint, sulfuric acid, MOGAS, and thinner.

These wastes were disposed of by burning at base landfills or fire training areas, applying to roads for dust control, or limited contract removal until 1960. After 1960, these wastes were primarily recovered in drums or bowsers for contract removal.

Several systems are used to collect oils and other waste materials spilled during normal operations. Floating oils are collected in a grease trap located in the stormwater drainage lines connecting Building 778 to Clover Creek. A floor drain in Building 777 connects to the sand and oil separator before discharging to Clover Creek. Floor drains in Building 779 discharge into two dry wells (Site 44). Some wastes from Buildings 777 and 779 also drain to the sanitary sewer.

n. Auto Hobby Shop

Automotive maintenance by base personnel takes place in the auto hobby shop. Waste materials generated include kerosene, solvents, oil, and PD-680. Until 1960 these wastes were disposed of by burning in base landfills and fire training areas, applying to roads for dust control, or limited removal by contract. After 1960, disposal was primarily by contract removal. Parts are degreased in a basin that drains the solvent back into a drum; a small pump in the drum recirculates the solvent. The contents of the drum are changed monthly by contract.

3. Fuels

A variety of jet and propeller aircraft have been stationed at McChord AFB since 1940. As a result, the fuel storage and distribution systems have handled JP-4, AVGAS, and MOGAS. No AVGAS has been used or stored at McChord AFB since 1974.

The major fuel storage tank farm has been in existence since 1952. Currently, the tank farm has a capacity of 2,205,000 gallons of JP-4. A complete inventory of storage tanks is contained in Appendix D, including location, capacity, and type of POL stored. Abandoned POL tanks are described in Appendix E.

The aqua system was used for AVGAS distribution from the 1940's until the late 1950's. There was no history of leaking from the system, which was flushed and filled with water. Three or four of the eight 25,000-gallon tanks were put into use later for the deluge fire protection system.

There have been numerous fuel spills and leakage incidents involving JP-4, AVGAS, and fuel oil during the history of the base. The significant incidents involving large quantities of fuel are described in Section B of this chapter.

The tank farm personnel have drained water and small quantities of fuel from the tanks daily since 1952. Forty to 100 gallons of combined liquid per month were drained from the tanks. Prior to 1973, the mixture of water and fuel was drained to the ground and from there to a leach pit at the northwest corner of the tank farm (Site 34). In 1973, a barrel and site gauge system was installed to reduce fuel loss, and in 1976 an oil-water separator was installed prior to the leach pit. The tanks were cleaned every 3 years (currently every 5 to 6 years), and the small quantity of sludge was disposed of in pits to the west of the tank farm (Site 34). Less than 200 gallons of tank sludge were generated when the tanks were cleaned.

No. 2 fuel oil is used on base for heating various buildings and housing units. The central heating plant used approximately 26,000 tons of coal (6 percent ash) until the early 1970's, when it was converted to natural gas.

4. POL Disposal

POL disposal practices at McChord AFB have primarily included on-site burning and off-site landfilling. Prior to 1961 when a centralized collection tank was installed, most waste POL was burned in a trench or pit at the landfill near the golf course club house. Between 1950 and 1960, waste POL (as opposed to slightly contaminated or clean JP-4) was also burned for fire training exercises at two pits on either side of Morey Creek. Additional details on each site are included in Section B of this chapter. Waste POL was taken to these sites in barrels and bowsers. During this period, small quantities of POL were also spread on roads for dust control in the summer.

In 1961, a 10,000-gallon underground centralized waste oil tank was installed near Building 734 to collect waste oil, fuel, hydraulic fluid, and solvents for contract removal and off-site recycling or disposal. Between 1972 and 1974, a 10,000-gallon underground tank was installed near Building 730 for waste fuel storage. A 1,200-gallon undertank near Building 434 is currently used for storing synthetic jet engine oil prior to recycling. Other small waste POL tanks and tanks associated with oil-water separators are scattered around the base. During the 1950's reciprocating engine oil was directly recycled on base or later recycled off base.

5. Fire Department Training

Fire training activities have taken place at McChord AFB since its inception. Past and present fire department training activities have taken place on six sites.

Each of the sites is described in greater detail in Section B of this chapter, including data on site characteristics, types and quantities of fuel burned, operational practices, and frequency of usage.

6. Ordnance Inactivation and Disposal

EOD activities at McChord AFB have included demolition training and larger scale disposal using burning kettles, a demolition range, and various burial sites. Significant quantities of several types of unexploded ordnance have been found within the boundaries of the 800 area storage compound and in a burial site to the immediate south of the compound. The burial site may contain approximately 500 unexploded rifle grenades. No unexploded ordnance problems have been reported in association with the old burn kettles (used in the 1950's) to the north of the compound. Though none of these sites is expected to pose a contamination or contaminant migration hazard and the area was surface cleared in 1972, ordnance personnel believe that unexploded ordnance may pose a significant danger to the Phase II site investigations that take place to the north of the golf course and to the west of the west entrance road. Proper care must be exercised in this area.

7. PCB Management

PCB's have been typically used in insulating oils for electric transformers. Out-of-service transformers are stored at the new hazardous waste storage bunker. Four transformers are slowly leaking in a vault in Building 100. Absorbent is used to control the leak, but no testing has been done to determine PCB levels. The transformers are to be taken out of service by the end of 1982. During November 1980, leaking transformer oil in the vicinity of Building 745 was checked

and found to contain less than 2 ppm PCB, therefore posing no disposal restrictions. Since the 1950's, it has not been the practice of base personnel to change transformer oil. All out-of-service transformers were and are sent to DPDO for disposal or to contract repair. No reports were made of transformer disposal in base landfills.

8. Pesticide Usage

Herbicides and other pesticides are applied on base for weed, insect, and other pest control. Both 62 CES entomology (basewide) and roads and grounds (golf course) use pesticides at McChord AFB. Herbicides and insecticides in use are described earlier in this section in Table 6. DDT has not been used since at least 1976 and Avitrol was last used in 1978.

Detailed information on practices prior to 1976 was not available, but there were no reports of out-of-date or excess herbicides and other pesticides being disposed of on base. Proper preparation, application, and container disposal practices are used. Until the late 1970's, empty containers were disposed of in on-base landfills. Rinse water is saved and used for dilution water with the next batch. In 1980, a 500-gallon rinse water holding tank was installed at the entomology shop. When the tank is three-fourths full, the waste will be disposed of off base by DPDO.

9. Wastewater Collection and Treatment

Sanitary sewage has been pumped to the Ft. Lewis sewage treatment plant. In the mid-1970's, the Ft. Lewis plant was expanded to provide secondary treatment, and effluent is discharged directly to Puget Sound.

The wastewater leaving the base is not monitored for quality, and only occasionally are flow measurements taken by Ft. Lewis personnel. As a result of these measurements, significant groundwater infiltration flows were identified in the length of pipeline near where it leaves McChord AFB. A limited program of grouting and sealing this section of the line was completed in 1980. The personnel at Ft. Lewis still believe that flow fluctuations indicate other locations where groundwater infiltration, and possibly sewage exfiltration, exist in the sanitary sewer system. The exfiltration, if it does occur, is important in that some industrial wastes are discharged to the sanitary sewer system, and exfiltration through leaky joints or broken pipe could be a source of groundwater contamination. This matter should be further explored by the base environmental program.

Eight septic tank systems have been identified on McChord AFB. Only one (Site 56) was identified as having potentially received industrial wastes; it is fully described in Section B of this chapter.

The storm-industrial drainage system has historically been one of the primary industrial waste disposal avenues. All parts of the system discharge to Clover Creek from a variety of shop and ramp areas. (See Table 4 for identity of individual shops.) There were numerous reports of direct or indirect dumping of industrial waste into Clover Creek during the 1940's, 1950's, and 1960's. A 1963 report (an appendix to 1968 USAF report) identified at least 30 discharge points to Clover Creek that could contain industrial wastes. At this time, oil and grease separators were reported to be installed in the Hangar 4/AGE area and the Hangar 1 and 2 area. The report also mentioned several minor fish kills in Clover Creek between 1957 and 1961. During 1966, the industrial sources were monitored weekly; 158 oil slicks were

observed, with 17 described as heavy. As a result of these studies and a detailed 1968 study, eight belt skimmer oil-water separator facilities were installed in the storm-industrial drainage system at various discharge points to Clover Creek. Seven of the skimmers discharge to Clover Creek and one to the sanitary sewer. Appendix F lists these skimmers and their location. In addition, there are approximately 26 gravity oil-water separation tanks (also listed in Appendix F) and numerous oil and grease traps located at various sites at McChord AFB.

McChord AFB Bioenvironmental Engineering staff have recently conducted several dye studies in the industrial shops in Hangars 1 and 2 and Building 745. No connections to Clover Creek have been shown between the floor drains or other discharge lines from the shops.

10. Other Activities

Two radioactive waste disposal sites were identified and are further described in Section B of this chapter (Sites 3 and 35). Though no evidence was found concerning the use or manufacture of biological warfare agents, a 1953 base master plan shows a toxics storage area using temporary buildings in the vicinity of Building 835. No additional information could be obtained. This matter should be further explored by the base environmental program.

During the early 1960's, a 50,000-gallon concrete tank was reportedly installed in the parking lot in front of Hangar 1. Though no record or surface evidence exists of the tank, it was supposedly connected to the NDI shop and possibly the wheel and tire shop, pneudraulics shop, and paint booth. The existence of this tank should be investigated during Phase II.

B. DISPOSAL SITE IDENTIFICATION AND RATING

Interviews with 81 past and present base personnel resulted in the identification of 62 disposal or spill sites at McChord AFB. These sites included 2 current and 4 former landfill areas, 20 demolition disposal or solid waste dump areas, 22 liquid or sludge disposal areas, and 14 fuel or POL spill areas.

A preliminary screening was performed on all 62 identified past disposal and spill sites based on the information obtained from the interviews and available records from the base and outside agencies. Using the decision tree process described in the Introduction, Section E and based on all of the above information, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. For those sites where hazardous material contamination was considered significant, a determination was made whether a significant potential exists for contaminant migration from these sites. A summary of this evaluation is given in Table 5. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology (HARM), which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: the waste and its characteristics, potential pathways for waste contaminant migration, the receptors of the contamination, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix [illegible]. Copies of the completed rating forms are included in Appendix [illegible]. A summary of the overall hazard ratings is given in Table 6.

Table 5
DISPOSAL SITE RATING SUMMARY

Site	Waste Type	Potential Hazard: Contamination	Potential Hazard: Migration	Potential Hazard: Rating	Page in Text
1	Industrial, Demolition	Yes	Yes	Yes	80
2	Industrial, Domestic	Yes	Yes	Yes	80
3	Radioactive	Yes	No[a]	No	98
4	Rubbish, Garbage, Industrial	Yes	Yes	Yes	95
5	Industrial, Domestic, Construction	Yes	Yes	Yes	88
6	Industrial, Domestic, Construction	Yes	Yes	Yes	88
7	Industrial, Domestic, Construction	Yes	Yes	Yes	88
8	Ash	No	NA	No	98
9	Construction	No	NA	No	98
10	Industrial, Domestic, Construction	Yes	Yes	Yes	89
11	Construction, Demolition	No	NA	No	98
12	Industrial, Construction, Ash	Yes	Yes	Yes	95
13	Industrial, Domestic, Construction	Yes	Yes	Yes[b]	93
14	Construction, Demolition	No	NA	No	99
15	Domestic	No	NA	No	99
16	Miscellaneous Equipment	No	NA	No	99
17	Industrial, Demolition	No[c]	NA	No	99
18	Caustic Soda	No	NA	No	100
19	Domestic, Demolition	No	NA	No	100
20	Domestic, Demolition	No	NA	No	100
21	Construction, Demolition	No	NA	No	100
22	Industrial, Vehicles, POL	Yes	Yes	Yes	94
23	Construction, Demolition	No	NA	No	100
24	Street Sweepings	No	NA	No	101
25	Street Sweepings	No	NA	No	101
26	Ordnance, Rubbish	Yes	No	No	101
27	Fuel	Yes	Yes	Yes	93
28	Fuel	Yes	Yes	Yes	96
29	Fuel	No	NA	No	101
30	Waste POL, Solvents, Fuel	Yes	Yes	Yes	91
31	Waste POL, Solvents, Fuel	Yes	Yes	Yes	92
32	Fuel	Yes	Yes	Yes	96
33	Fuel	Yes	Yes	Yes	96
34	Fuel, Sludge	Yes	Yes	Yes	80
35	Radioactive	Yes	Yes	Yes	97
36	POL, Solvents, Paints	Yes	Yes	Yes	94

NOTE: NA = Not applicable using decision tree methodology.

[a] No current migration caused by past potential contamination.

[b] Referred to base environmental program.

[c] Hazardous waste not generated in quantity sufficient to cause contamination.

Table 5
(continued)

Site	Waste Type	Potential Hazard: Contamination	Potential Hazard: Migration	Potential Hazard: Rating	Page in Text
37	Waste POL, Solvents, Fuel	Yes	Yes	Yes	84
38	Waste POL, Solvents, Fuel	Yes	Yes	Yes	82
39	Waste POL, Solvents, Fuel	Yes	Yes	Yes	89
40	Waste POL	Yes	Yes	Yes	82
41	Fuel	Yes	Yes	Yes	82
42	Fuel	Yes	Yes	Yes	85
43	Waste POL	No[a]	NA	No	102
44	Waste POL, Fuel	Yes	Yes	Yes	92
45	Fuel	Yes	No[b]	No	102
46	Fuel	Yes	Yes	Yes	81
47	Fuel	Yes	Yes	Yes	83
48	PCP	Yes	Yes	Yes	95
49	Waste POL, Solvents, Fuel	Yes	Yes	Yes	90
50	Waste POL, Solvents, Fuel	Yes	Yes	Yes	90
51	Waste POL, Solvents, Fuel	Yes	Yes	Yes	91
52	Waste POL	Yes	Yes	Yes	83
53	Waste POL, Solvents, Fuel	Yes	Yes	Yes	83
54	Waste POL, Solvents, Fuel	Yes	Yes	Yes	85
55	Waste POL, Solvents, Fuel	Yes	Yes	Yes	84
56	Industrial, Waste POL, Solvents	Yes	Yes	Yes	97
57	Industrial, Waste POL, Solvents	Yes	Yes	Yes	86
58	Industrial, Waste POL, Solvents	Yes	Yes	Yes	97
59	Fuel Oil	Yes	Yes	Yes	97
60	Waste POL, Solvents, Fuel	Yes	Yes	Yes	86
61	Plating Waste Acids	Yes	Yes	Yes	87
62	Plating Wastes	Yes	Yes	Yes	87

NOTE: NA = Not applicable using decision tree methodology.

[a]Hazardous waste not generated in quantity sufficient to cause contamination.

[b]No current migration caused by past potential contamination.

Table 6
SUMMARY OF SITE RATING RESULTS

Site	Waste Type	Subscores: Receptors	Subscores: Waste Characteristics	Subscores: Pathways	Gross Total Score	Waste Management Practices Factor	Final Score
Area A							
1	Industrial, Demolition	70	40	75	62	1.0	62
2	Industrial, Domestic	72	70	80	74	1.0	74
34	Fuel, Sludge	72	56	58	62	1.0	62
46	Fuel	72	64	58	65	1.0	65
Area B							
38	Waste POL, Solvents, Fuel	72	64	58	65	1.0	65
40	Waste POL	72	48	58	59	1.0	59
41	Fuel	72	80	58	70	1.0	70
47	Fuel	69	72	58	66	1.0	66
52	Waste POL	69	48	58	58	1.0	58
53	Waste POL, Solvents, Fuel	72	48	76	65	1.0	65
55	Waste POL, Solvents, Fuel	72	64	60	65	1.0	65
Area C							
37	Waste POL, Solvents, Fuel	72	64	58	65	1.0	65
42	Fuel	69	48	58	58	1.0	58
54	Waste POL, Solvents, Fuel	69	90	80	80	1.0	80
57	Industrial, Waste POL, Solvents	69	60	67	65	1.0	65
60	Waste POL, Solvents, Fuel	69	60	67	65	1.0	65
61	Plating Waste Acids	69	40	67	59	1.0	59
62	Plating Wastes	69	60	80	70	1.0	70
Area D							
5	Industrial, Domestic, Construction	69	72	75	72	1.0	72
6	Industrial, Domestic, Construction	72	36	84	64	1.0	64
7	Industrial, Domestic, Construction	69	54	75	66	1.0	66
39	Waste POL, Solvents, Fuel	Included in site No. 5					
Area E							
10	Industrial, Domestic, Construction	69	36	67	57	1.0	57
49	Waste POL, Solvents, Fuel	69	64	58	64	1.0	64
50	Waste POL, Solvents, Fuel	69	64	76	70	1.0	70
51	Waste POL, Solvents, Fuel	69	64	76	70	1.0	70
Area F							
30	Waste POL, Solvents, Fuel	70	72	75	72	1.0	72
31	Waste POL, Solvents, Fuel	70	72	75	72	1.0	72
Area G							
44	Waste POL, Fuel	69	72	49	63	1.0	63
Area H							
27	Fuel	70	64	58	64	1.0	64
Area I							
13	Industrial, Domestic, Construction	72	30	84	62	1.0	62
22	Industrial, Vehicles, POL	72	40	58	57	1.0	57
Area J							
36	POL, Solvents, Paints	69	48	56	58	1.0	58
48	PCP	69	60	58	62	1.0	62
Others							
4	Rubbish, Garbage, Industrial	72	36	67	58	1.0	58
12	Industrial, Construction, Ash	69	32	67	56	1.0	56
28	Fuel	70	40	58	56	1.0	56
32	Fuel	70	40	31	47	0.2	9
33	Fuel	69	48	40	52	1.0	52
35	Radioactive	69	30	53	51	1.0	51
56	Industrial, Waste POL, Solvents	69	40	49	53	1.0	53
58	Industrial, Waste POL, Solvents	69	20	58	49	1.0	49
59	Fuel Oil	69	48	49	55	1.0	55

AD-A123 311 INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR MCCHORD AIR FORCE BASE WASHINGTON(U) CH2M HILL GAINESVILLE FL AUG 82 F08637-80-G-0010

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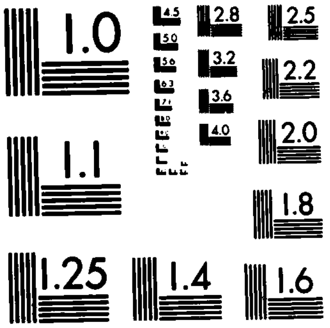


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Of the 62 sites, 19 were determined to pose no threat of potential contamination or migration (see Introduction, Section E). Of the 43 remaining sites that were rated, 34 sites were rated high enough to need to be addressed in the recommendations (see Conclusions). Many of these final 34 sites are located in geographically contiguous areas and recommendations can be efficiently developed for these areas rather than for individual sites. Therefore, the first 34 sites presented below are presented by area groupings rather than in numerical order. The remaining 9 rated sites for which no recommendations are made and 19 unrated sites then follow in sequential but not continuous numerical order. Table 5 summarizes this arrangement and includes information for easier location of the non-numerically ordered site descriptions in the text. In general, the potential for migration of hazardous wastes from disposal sites at McChord is high because of the high area rainfall, high net infiltration, and the high water table. For this reason, most sites containing significant amounts of hazardous wastes are rated. Exceptions to this condition are indicated and documented in the pertinent site description.

A brief description of each site identified at McChord AFB follows. Solid waste disposal sites are shown in Figure 15. Liquid waste disposal sites and spill areas are shown in Figure 16. Approximate dates of major disposal site usage are shown in Figure 17.

a. Sites Rated and Included in Recommendations

<u>Area A</u> - Includes Sites 1, 2, 34, and 46 (Milburn Pond landfill, drum burial pit, and tank farm sludge, leach pit, and fuel spill area).

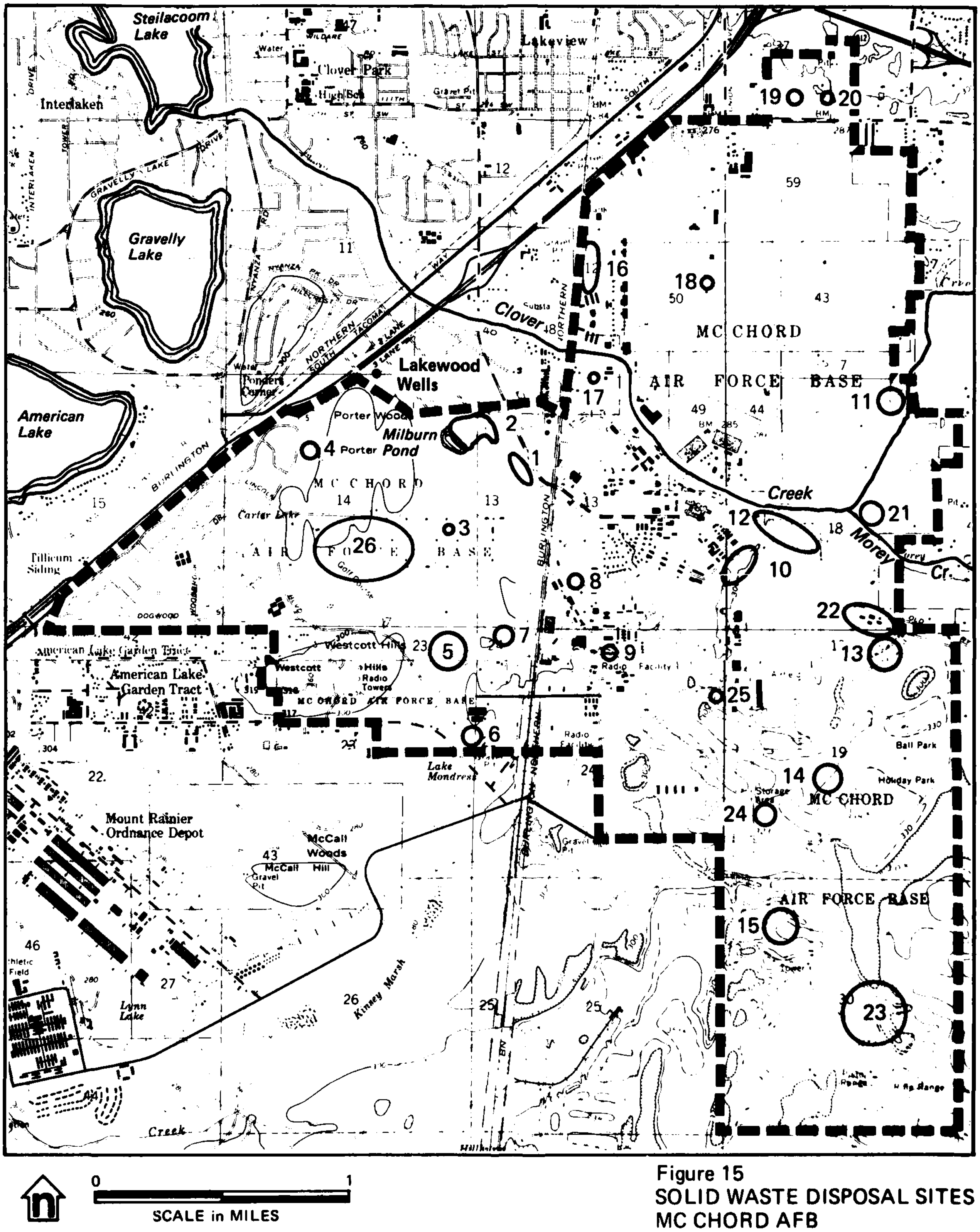


Figure 15
SOLID WASTE DISPOSAL SITES
MC CHORD AFB

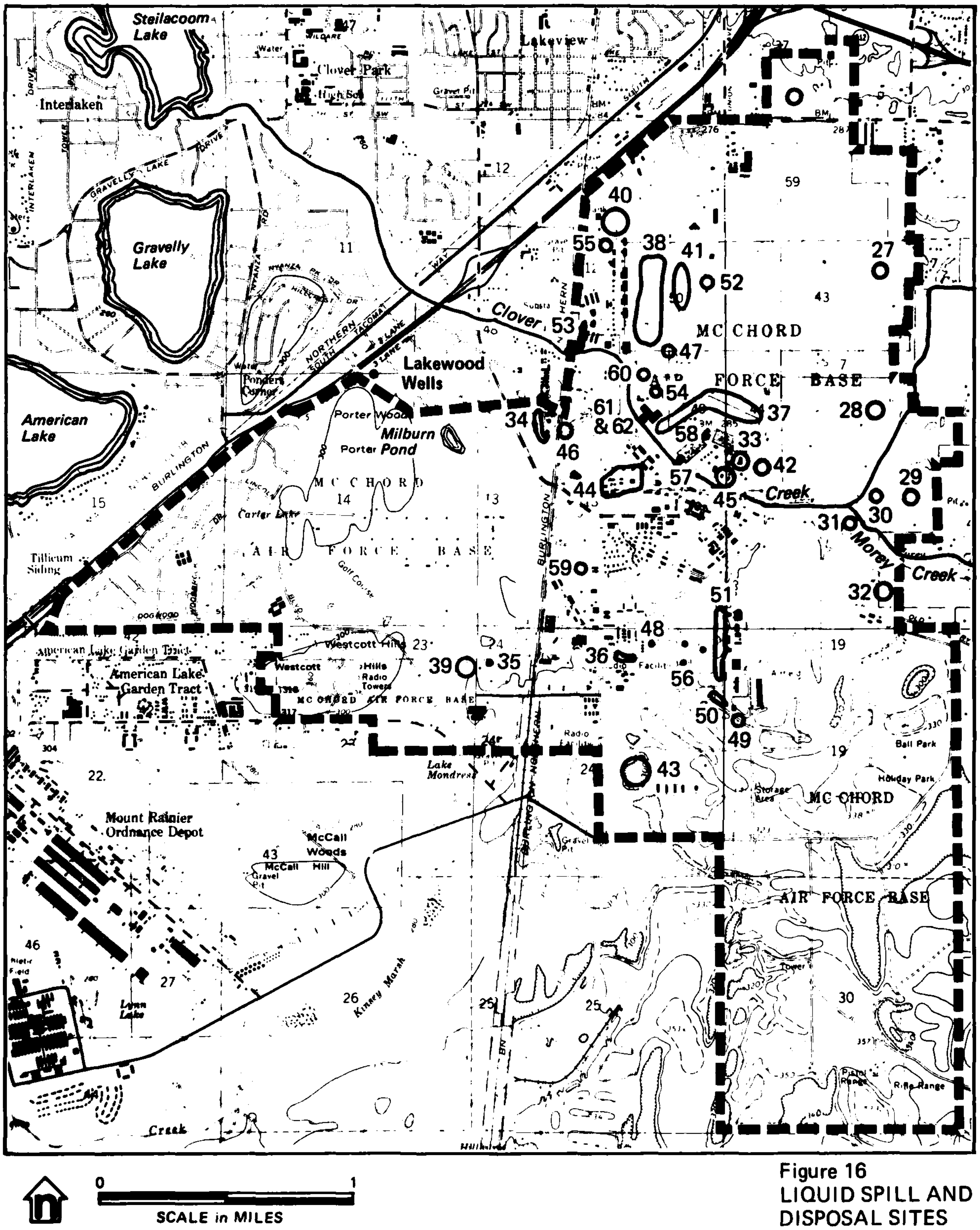


Figure 16
LIQUID SPILL AND
DISPOSAL SITES
MC CHORD AFB

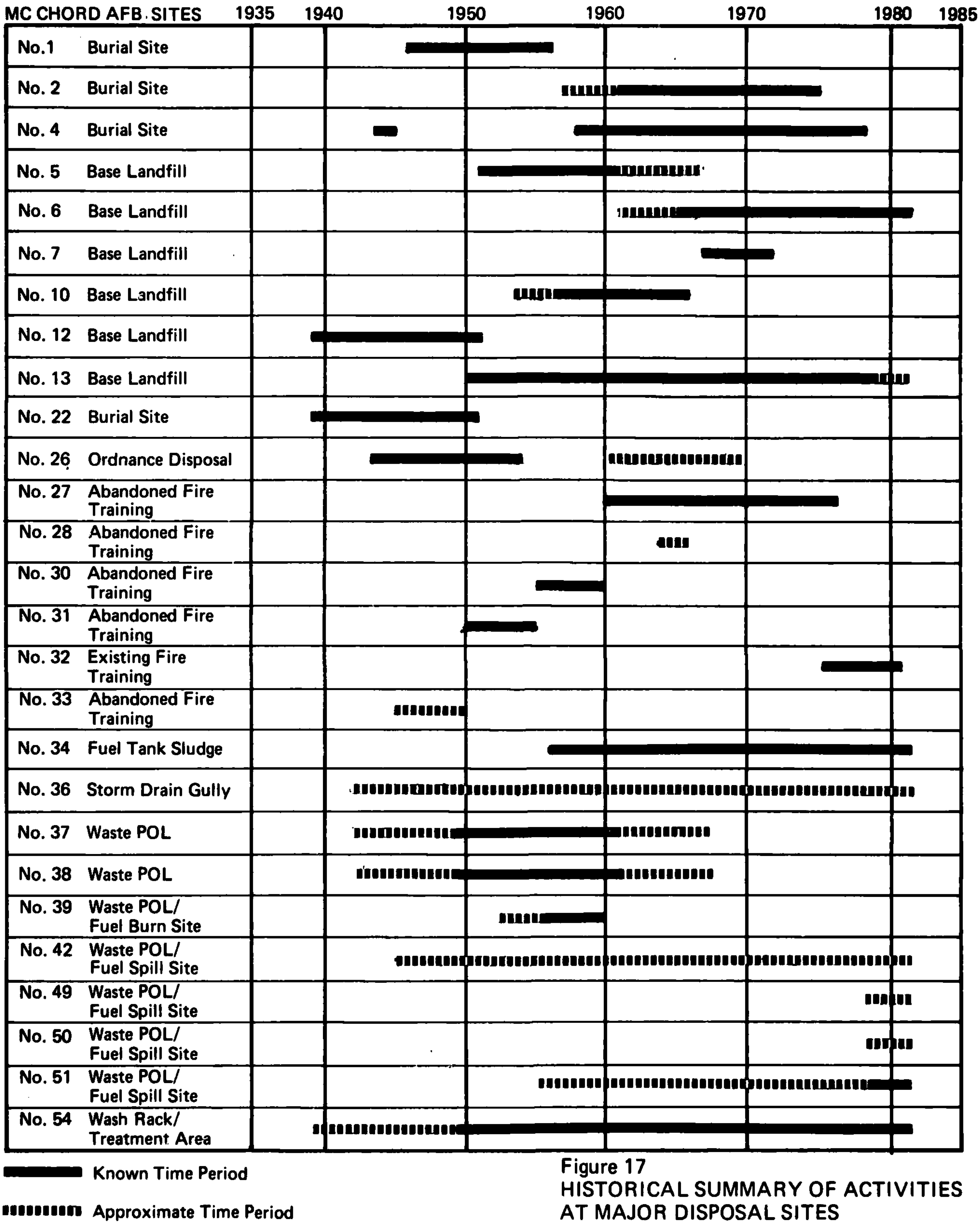


Figure 17
HISTORICAL SUMMARY OF ACTIVITIES
AT MAJOR DISPOSAL SITES
MC CHORD AFB

Site No. 1: Burial pit located southwest of the west entrance to McChord AFB. This site was originally a natural depression. One report indicated the site might have been used as early as 1946 for disposal of ash and tree stumps. Approximately 100 barrels of unknown volume and content may have been buried here in the mid-1950's. When Hangars 1 and 2 were gutted by fire in 1956, much of the burned debris was buried here. Large quantities of potentially hazardous wastes may have been buried here and the potential exists for migration. Therefore, rating is required for this site. The final site rating score is 62.

Site No. 2: Milburn Pond burial pit located west of the west entrance to McChord and east of Porter Hills, adjacent to McChord Drive. This area was once a peat bog. Materials that were dumped here slowly sank beneath the surface of the bog and apparently decreased the permeability of the bottom of the bog such that it began to hold water throughout the year in the mid-1960's. This site was used from between 1957 and 1961 until 1976. Originally, ash from the base power plant was buried here. Later, disposal of all types of base wastes including industrial, domestic, construction, and demolition wastes was common practice. In addition, domestic wastes from the surrounding residential areas may have been disposed of at the site prior to 1954. A site inspection by CH2M HILL personnel revealed several drums submerged in Milburn Pond. Large quantities of potentially hazardous wastes may have been buried here and the potential exists for migration. Therefore, rating is required for the site. The final site rating score is 74.

Site No. 34: Disposal and spill site located in the immediate vicinity of the tank farm. This site has been used since 1956 for disposal of fuel tank sludge, JP-4, and leaded fuel. A leach pit for spill containment is located just

outside the southwestern corner of the tank farm fence line. The capacity of this dry pit is between 20,000 and 30,000 gallons. It is likely that this pit has been used for disposal of waste fuels, although there have been no specific reports of such use. Several 300- to 500-gallon fuel spills occurred in the vicinity of the tank farm in past years. An AVGAS spill of 15,000 gallons was reported to have occurred at the tank farm in 1973. No information is available concerning the fate of this spill, but it is assumed that the spill was contained within the diked area surrounding the tanks. Tank sludges have been disposed of on the ground outside the fence line. One individual estimated the quantity disposed of in this manner to be approximately 20 gallons every three years. A leach pit and oil-water separator are located on the northwestern corner of the tank farm. Surface drainage collected within the diked area is drained into this mechanism. It has been noted that waste fuels were not always completely separated from the storm drainage before it was discharged to the leach pit. Thus, some fuels may have penetrated into the surrounding soils. Finally, fuel filters have been aired and dried on the ground outside of the tank farm. The nature of these wastes is hazardous. Large quantities of potentially hazardous wastes are involved and migration into the groundwater is possible. Rating is required for this site. The final site rating score is 62.

Site No. 46: Fuel spill at the railroad yard located east of the tank farm. A 50,000-gallon JP-4 fuel spill was reported to have occurred here during the late 1960's. Apparently, all of the spilled fuel infiltrated into the ground. Persons interviewed gave no indication that any of the lost fuels were recovered or that the site was ever cleaned up. The characteristic of the spilled fuel is hazardous and groundwater contamination by migration is possible due to

the large quantity involved. Rating is required for this site. The final site rating is 65.

Area B - Includes Sites 38, 40, 41, 47, 52, 53, and 55 (several fuel spills/leaks, waste POL spills/disposal, and drainage ditch in the vicinity of C Ramp).

Site No. 38: Liquid disposal site located along "C" ramp. This site was used from the 1940's until the 1960's. Several reports have indicated that as much as 50 to 100 gallons per month of waste fuels and POL were dumped into the gravel off the back of the concrete ramp. Since that time, the ramp has been enlarged and parts of the disposal site have been covered with concrete. A 1,500- gallon fuel spill was reported to have occurred in 1980 in this area. Of this, approximately 900 gallons were recovered from the skimmer. The remainder percolated into the ground near the defueling tanks. The characteristics of the wastes believed disposed of here are hazardous and migration into the groundwater is possible. Rating is required for these sites. The final site rating score is 65.

Site No. 40: Liquid waste disposal site located north of Building 1170. Waste POL was spread over this site to control grass. Solvents associated with motor pool activities were also reported to be disposed of here. The site was used from 1951 until the early 1960's. Potentially hazardous wastes were discarded here and migration to the groundwater is possible. Rating is required for this site. The final site rating score is 59.

Site No. 41: Fuel spill near MAC "C" ramp. In 1965, "C" ramp was extended and, during construction, a 12-inch AVGAS fuel line was broken. Reports indicated that this line may have leaked undetected for as long as 6 months.

The quantity of fuel leaked is unknown. When maintenance crews were attempting to locate the leak, "millions of gallons" of water were flushed through the line before evidence of the leak became visible on the surface of the ground. Evidently, whatever fuel was lost passed into the soils in the surrounding area and may have migrated to the groundwater. Rating is required for this site. The final site rating score is 70.

Site No. 47: Fuel spill site located at the southeastern corner of the MAC "C" ramp. Approximately 20,000 to 25,000 gallons of fuel were leaked from an underground pipe. Neither the date of the spill nor the type of fuel could be identified. The report indicated that the fuel leak did not show up on the surface of the ground. The fuel spilled at this site is hazardous and migration is possible due to the large quantity involved. Rating is required for this site. The final site rating score is 66.

Site No. 52: Spill site located at Building 1173. Oil, synthetic lubricants, and hydraulic fluids are stored in sheds next to Building 1173. A waste oil bowser is also located in this area. Some leaking and spilling of these materials into the gravel has occurred at the site. These materials are hazardous in nature and the potential for migration of these wastes exist. Rating is required for this site. The final site rating score is 58.

Site No. 53: Spill site located west of the barracks, Buildings 1147 to 1159. At this location skimmer No. 1 drains through a culvert into a storm drainage ditch connecting to Clover Creek. There have been several reports of oils flowing through the skimmer and into this channel. At the time this site was visited by CH2M HILL personnel a small amount of oil was being discharged into the ditch from the culvert

connecting to skimmer No. 1. Some environmental stress was evident in the vegetation lining the banks of the channel and there was a distinct petroleum odor. The quantity and specific types of wastes being discharged into this ditch are unavailable, but these wastes include small quantities of waste fuels, POL, and solvents. The characteristics of these materials are hazardous. Rating of this site is required. The final site rating score is 65.

Site No. 55: Spill area located west of Building 1170 and between Buildings 1170 to 1164. In this area the asphalt was dug up several times and removed because of decay caused by recurring fuel spills in the area. Also, floor drains from each of the buildings (potentially carrying POL and solvents) flow to sumps that have overflowed periodically. Aircraft maintenance activities have taken place in these nosedocks since their construction. No information is available concerning the frequency or quantity involved during these spills. Some of the underlying soils may also have been contaminated and it is uncertain whether these soils were removed. The characteristics of the fuels and POL/ solvent spilled in this area are hazardous. Migration of contaminants from the site is possible. Rating is required for this site. The final site rating score is 65.

<u>Area C</u> - Includes Sites 37, 42, 54, 57, and 60 (wash rack leach pits, test cell leach pits, Hangar 1 leach pit, D Ramp fuel, and waste POL spills/disposal).

Site No. 37: Liquid disposal site located along "D" ramp. This site was used from the 1940's until the 1960's. Several reports have indicated that as much as 50 to 100 gallons per month of waste fuels and POL were dumped into the gravel off the back of the concrete ramps. Since that time, the ramp has been enlarged and parts of the disposal sites have been

covered with concrete. The characteristics of the wastes believed disposed of here are hazardous and migration into the groundwater is possible. Rating is required for these sites. The final site rating score is 65.

Site No. 42: Liquid waste spill area located at the refueling docks. This site was reported to be an area where waste POL and fuels have been spilled onto the ground. It was described as being "messy" at times. One report indicated that the maximum spill may have been around 300 gallons but most were less than 40 gallons. Another report suggested that a spill of 1,000 gallons or more occurred once every 3 to 5 years. The characteristics of the medium quantities wastes spilled in this area are potentially hazardous. Rating is required for the site. The final site rating score is 58.

Site No. 54: Liquid waste spill and disposal site located adjacent to the 745 washrack and including the industrial waste treatment system located at Building 790. This washrack has been active since the early 1940's. A wide variety of solvents, alkaline-base detergents, paint removers, and corrosion removing compounds has been used here. In addition, industrial wastes from the degreasing operation and other sources at Building 745 were directed to this facility. The site has also served as a storage area for waste oils, fuels, and solvents off the MAC "C" ramp. Until 1948 many of the materials drained directly off the washrack into Clover Creek. Some type of industrial treatment system has always been in operation since 1948. Waste oils collected in these systems were stored in drums or bowsers at the site prior to on-base POL disposal. The industrial waste treatment system at Building 790 includes an oil skimmer with two leach pits. Various reports have indicated that at times the skimmer has not operated correctly and oils were discharged directly

into the leach pits. Instances were reported of having to reexcavate the leach pits because they were plugged from sludges and oils. There is little information regarding the quantities of specific pollutants being discharged off the washrack, but it is suspected that the quantities are large. A 1968 report by the Regional Environmental Health Laboratory estimated the total flow to the leach pit to be 8,000 gallons per day. Additionally, 1 to 2 gallons per week of trichloroethane were reportedly dumped into the storm drains near the 745 washrack in 1969 and before. The characteristics of these large quantities of wastes are hazardous anc ıigration is unavoidable due to the large quantities of was and water involved. Unconfirmed reports of soil corii ındicated oily wastes were migrating from the site in the 1 's. Rating is required for this site. The final site ‐ .ıng score is 80.

Site No. 57: Industrial leach pit located on the southwest side of Hangar 1. A great deal of industrial activity has occurred in Hangar 1 throughout the history of the base. It is known that NDI and the Prop Shop (degreasing) have discharged into this leach pit. Reportedly, only small quantities of waste POL or solvents were washed to this site. Other activities that have occurred in Hangar 1 have been engine repair, welding, and electroplating. Many of the industrial products used by these shops are hazardous. Historical reports indicate the pit would periodically plug and overflow "oil" to Clover Creek. Migration of some of these materials into the groundwater is possible. Rating is required for this site. The final site rating score is 65.

Site No. 60: Combination of leach pit and storm drainage infiltration ditches connected to floor drains at Buildings 792 and 789 jet engine test cells. This system has been used since the late 1950's. Though most hydraulic

fluid, oil, and solvent has been directed to bowsers or barrel storage for on-base POL disposal, cleaning compounds and unknown amounts of other POL wastes have been disposed of at this site. Small quantities of hazardous materials have been disposed of at this site and there is the potential for migration. Rating of this site is required. The final site rating score is 65.

Site No. 61: Leach pit (acid dry well) located between Building 745 and Clover Creek. The leach pit (10 to 15 feet deep) was probably installed in 1953 and was used until 1960, when these flows were connected to the industrial waste treatment facility and leach pit (Site 54). Samples of gravel from the bottom of the pit have been subject to bioassay tests with the results indicating no particular problems. Small quantities of hazardous wastes from the plating process may have been disposed of in this site and there is a potential for migration. Therefore, rating of this stie is required. The final site rating score is 59.

Site No. 62: Dump pad and infiltration area for disposal of plating tank sludges. Little is known about the period of use or quantities involved. During the first half of 1982, 18 surface soil samples (0 to 18 inches composite) were collected and analyzed for cadmium, lead, and zinc. Background levels appear to be as follows: cadmium 1-2 mg/kg, lead 8-12 mg/kg, and zinc 40-50 mg/kg. Contaminated soils levels range as follows: cadmium 8-384 mg/kg, lead 40-530 mg/kg, and zinc 60-180 mg/kg. Sediments at the outlet of a 10-inch VC pipe (originally draining a curb inlet) leading from this area to Clover Creek (150 feet) contained these contaminants at levels from 30 to 140 mg/kg. Dye tests in the contaminated area show rapid connection of this area with the 10-inch VC pipe and Clover Creek. This pipe outlet was recently plugged with concrete. Medium quantities

of plating sludges may have been disposed of at this site and the potential for migration exists. Therefore, rating of this site is required. The final site rating is 70.

Area D - Includes Sites 5, 6, 7, and 39 (golf course club house landfill and burning trench, SAGE landfill, and 17th fairway landfill).

Site No. 5: Landfill located at the golf course under the existing 8th, 9th, 10th fairways. This site was a major base landfill in operation from 1951 until 1961. Its use was terminated when construction began on the first nine holes of the golf course. Open burning occurred at this site until the landfill was closed. A waste oil burn pit was in operation from 1952 until 1964 and a separate fuel burning pit was operated from 1964 until 1967 (Site 39). No information on the quantities of the waste fuels burned is available. This site was a major base landfill containing large quantities of potentially hazardous wastes. Therefore, rating is required for this site. The final site rating score for this site and Site 39 is 72.

Site No. 6: Landfill located in the SAGE area behind Building 853. This currently active landfill and borrow pit was started in the early 1960's. Materials disposed of here include industrial, domestic, and construction refuse. Excavation has proceeded to the groundwater table as indicated by standing water in the deepest section of this gravel pit. Small quantities of potentially hazardous wastes may have been buried here and there is a potential for migration. Therefore, rating is required for this site. The final site rating score is 64.

Site No. 7: Landfill located under the 17th fairway of the golf course. This site was in operation from about 1967

until 1972. Its estimated depth was 40 feet. Open burning occurred here until 1972 when Federal regulations banned such activities. A pond was reported to have existed before it was filled in by the landfill. All types of base wastes may have been disposed of here including industrial, domestic, and construction wastes. Small quantities of these wastes are potentially hazardous and migration is possible. Rating is required for this site. The final site rating score is 66.

Site No. 39: Liquid waste disposal site located adjacent to and on the west side of the 10th fairway of the golf course. This site was an integral part of the Site 5 disposal operations and located in the same area. Persons interviewed indicated that this site was a concrete trench where waste JP-4, solvents, and POL were burned. These activities were started before 1956 and ended in about 1960. An estimated 50 to 100 gallons per week were burned. The characteristics of the wastes disposed of here are hazardous and migration is possible even though the trench was supposedly made of concrete. Rating is required for this site and is included as part of Site No. 5. The final combined site rating score is 72.

<u>Area E</u> - Includes Sites 10, 49, 50, and 51 (landfill, fuel leach pit, waste POL leach pit, and waste POL leaching in storm drain ditches in 318th area).

Site No. 10: Landfill site located in a natural depression north of Building 304. This site was reported to be 25 feet deep and used from the mid 1950's until 1966. It was not supervised and not burned. However, this area appears to have been a major landfill site being used to dispose of industrial, domestic, and construction wastes. One report indicated that this site may have been used for wastes from

aircraft maintenance because it was closest to the flight line. Small quantities of potentially hazardous wastes may have been buried here and the potential exists for migration. Therefore, rating is required for this site. The final site rating score is 57.

Site No. 49: Liquid spill area located on the south end of Building 342. An oil-water separator, an oil storage tank, and a leach pit are located at this site. Several reports and an on-site inspection by CH2M HILL personnel revealed that waste oil and other waste materials have often contaminated the soils in this area. According to the McChord AFB real property list, Building 342 was built in 1962. Since then, it has housed the 318th Fuel Systems Repair Shop and the 318th AGE Shop. One report indicated that wastes from the oil-water separator at Building 342 were not regularly collected until some time in 1979. This has probably contributed to the oil spills in the area. Medium quantities of hazardous waste products have been spilled in the area and there is a high potential for migration. Rating is required for this site. The final site rating score is 64.

Site No. 50: Liquid spill site located west of Building 342. A stormwater drainage ditch runs from the 318th defueling area into a low point where the stormwater leaches into the ground. A distinct petroleum odor exists in the area and much of the vegetation is dead. Limited specific information is available concerning the types and quantities of waste products discharged into this area but spillage of large quantities of waste JP-4 is indicated. These spills have probably occurred since the building was constructed in 1962. A 2,000-gallon fuel spill at the defuel area in 1981 was reported. It is not certain whether this fuel spill was contained. The characteristics of the large quantities of wastes spilled in this area are hazardous and the potential

for migration exists. Rating is required for this site. The final site rating score is 70.

Site No. 51: Liquid spill site located west of the 318th FIS area. This site consists of a long storm drainage gully beginning just north of the Building 328 access road and ending in a natural depression north of Building 343. The point at which this drainage ends is close to Landfill Site No. 10. Little information is available regarding the types and quantities of wastes being discharged into this storm drainage system; however, CH2M HILL personnel noted indications of oily wastes in the gully. Shops that have existed at the 318th since 1955 have included aircraft and hangar maintenance shops. Information obtained from interviews indicated that industrial products used by such operations included solvents, POL, paints, corrosion preventives, and fuels. It is likely that the ditch has been contaminated with some, if not all, of these products since 1955. The appearance of the area supports this evidence. The characteristics of these wastes are hazardous. Migration is possible due to the quantities involved. Rating is required for this site. The final site rating score is 70.

Area F - Includes Sites 30 and 31 (old fire training areas near confluence of Morey Creek and Clover Creek).

Site No. 30: Fire training area located southeast of the hazardous cargo loading/unloading area between Morey Pond and Clover Creek. This site was used from 1955 until 1960. Thirty fire training exercises were conducted each year using about 300 gallons of fuel each. Any flammable liquid available was used for these fires, and included, but was not limited to, ether, solvents, alcohol, AVGAS, and oils. The waste POL was floated on water (water float) before lighting any fire. There was, however, no soil liner.

Large quantities of waste fuels were burned at the site and migration is possible. Therefore, rating is required for this site.

Site No. 31: Fire training area located south of the hazardous cargo loading/unloading area on the south side of Morey Pond. Fire training exercises were conducted here from 1950 until 1955. Thirty fire training exercises were conducted each year using about 300 gallons of fuel each. Any flammable liquid available was burned at these fires. These fuels included, but were not limited to, solvents, alcohol, AVGAS, and oils. A water float was used before lighting any fire. There was, however, no soil liner. Large quantities of waste fuels were burned at the site and migration is possible. Therefore, rating is required for this site.

<u>Area G</u> - Site 44 (motor pool leach pits in 700 buildings area).

Site No. 44: Liquid waste disposal and spill site located in the 700 buildings vehicle maintenance area. Reports indicated that large quantities of oil were spilled around the diesel tanks. Floor drains in Building 779 discharged into two dry wells. Specific wastes were not identified. It is reasonable to assume that they might have included waste fuels, POL, and solvents. Environmental stress in the form of dead grass resulting from spills in the area surrounding Building 744 was reported. As much as 500 gallons of waste POL were reported spilled around Building 718. A gas tank at Building 730 was reportedly leaking 25 to 30 gallons per day in the late 1950's for an unspecified period of time. The characteristics of these wastes are hazardous and migration is possible due to the large quantities involved. Rating is required for the site. The final site rating score is 63.

<u>Area H</u> - Site 27 (old fire training area between east taxiway and perimeter road).

Site No. 27: Fire training area located along the north end of the instrument runway, east of the east taxiway, and west of the perimeter road. Waste JP-4 and AVGAS were used to start fires in this area during the period 1960 until 1977. This area was not provided with a liner, but the fuels were floated on water before lighting during the training exercises. Twenty-four fire training exercises were conducted each year using about 300 gallons of fuel for each exercise. Large quantities of waste fuels were burned at the site and migration is possible. Therefore, rating is required for this site. The final site rating score is 64.

<u>Area I</u> - Includes Sites 13 and 22 (east base landfill and 200 buildings area, motor pool waste POL disposal).

Site No. 13: Landfill located east of the instrument runway and north of Holiday Park. This site was used from 1950 until 1979 when the dump was officially closed. Currently, some unauthorized dumping of construction debris and rubbish occurs. The unauthorized dumping has been reported to the base civil engineers for corrective action. Open burning was reported to have occurred during the 1950's. Six drums of paint sludge were reported buried in 1978. While inspecting the site, CH2M HILL personnel found a 20- to 30-foot-deep pit with standing water in the bottom. This indicates that the site is deep enough to penetrate into the water table. Small quantities of potentially hazardous wastes may be buried in this landfill and migration is possible. Therefore, rating is required for this site. The final site rating score is 62.

Site No. 22: Burial site located where Buildings 222 through 228 are located now. This site was reported to be the location of the motor pool from 1939 until 1951. During this period heavy equipment maintenance was done here. Materials buried here probably include cars and heavy equipment. One report indicated a military armored tank may be buried here as well. Reports have indicated that waste POL may have been generated and disposed of at the site. Medium quantities of potentially hazardous materials may be buried here and the potential exists for migration. Therefore, rating is required for this site. The final site rating score is 57.

Area J - Includes Sites 36 and 48 (Base Civil Engineering yard PCP tank spill area and yard runoff leach pit).

Site No. 36: A storm drain ditch originating near Building 540 and extending east beyond the fence line of the base civil engineering yard. Surface runoff from the civil engineering yard, including the shop areas, is collected and discharged into the open ditch. Pooling areas exist where this stormwater leaches into the ground. Shop drain discharge may have reached this storm drainage ditch through surface flow, including entomology shop wastes. Unidentified quantities of waste materials from the civil engineering yard, including waste paint, oil, and fuel, have been noted to drain into this gully. A site inspection by CH2M HILL personnel revealed some environmental stress in the vegetation lining the ditch. Oily material was visible along the banks. The characteristics of the wastes suspected of entering the ditch are hazardous. Migration of these wastes into the groundwater by infiltration is possible. Rating is required for this site. The final rating score is 58.

Site No. 48: Pentachlorophenol wood preservative tank located in the civil engineering yard. This site consists of a horizontal, above ground, covered steel tank that once contained PCP for use in preserving wood. This tank collects rainwater and has overflowed to the ground on occasion. Recently, the PCP content of the soil beneath this tank was measured and found to be than 69 ppm. The tank has been used in the CE yard since perhaps as early as the 1950's. As small quantities of hazardous PCP have been spilled at the site, the potential exists for migration of this material into the groundwater by infiltration. Therefore, this site requires rating. The final site rating score is 62.

b. Sites Rated but Not Included in Recommendations

Site No. 4: Burial site located west of Porter Hills near base housing. This waste disposal area was an old gravel pit. Reports indicated the site was used sporadically from 1941 to 1958. Rubbish, garbage, and industrial-type wastes were buried here from 1958 until 1978 as a large-scale disposal operation. The pit was reported to have been quite deep, probably into the groundwater table. Small quantities of hazardous wastes may be present and migration is possible. Therefore, rating is required for this site. The final site rating score is 58.

Site No. 12: Landfill located between the instrument runway and the south taxiway. This site was reported to have been an informal dump from 1939 until 1952 when the instrument runway was lengthened. At the time, it was located in a bog. Industrial wastes, construction wastes, and coal ash were reported buried here. Medium quantities of potentially hazardous wastes may have been buried here and the potential

exists for migration. Therefore, rating is required for this site. The final site rating score is 56.

Site No. 28: Fire training area located north of the hazardous cargo loading/unloading area and west of the perimeter road. This site was used for helicopter fire fighting training for 1 to 2 years during the early 1960's. Forty to fifty fire training exercises, each using 100 gallons of flammable liquids such as JP-4, were conducted each year. Small quantities of waste fuels were burned at the site and migration is possible. Therefore, rating is required for this site. The final site rating score is 56.

Site No. 32: Fire training area located east of the instrument runway and north of the 200-area buildings. This is the current fire training area. It has been in use since 1976. Pure or contaminated JP-4 is the only fuel that has been burned. Fire training exercises are conducted an estimated 10 days per year using 300 to 400 gallons of fuel per fire. The ability of these fuels to migrate from the area either by infiltration or surface runoff has been minimized by diking the area and lining it with a 1-foot-thick clay liner. Water is poured onto the area and the fuels floated on top before burning as an additional precaution against soil infiltration. Surface water drainage is to a separator where unburned fuels are skimmed off to a holding tank. The remaining water is discharged into a pipeline connected to the Ft. Lewis wastewater treatment plant. Rating for this area is still required. The final site rating score was 9 because of the waste management practices reduction factor.

Site No. 33: Fire training area located at the current fire station. Fire training exercises were conducted here from the late 1940's until 1950. AVGAS was the primary fuel used at these fires. Approximately 20 training exercises were

conducted each year, and 100 to 200 gallons of fuel were used at each fire. No information is available concerning a soil seal or a water float. Small quantities of waste fuel were burned at the site and migration is possible. Therefore, rating is required for this site. The final site rating score is 52.

Site No. 35: Liquid radioactive waste disposal site located at the existing golf course between the 10th, 17th, and 18th fairways. Washwater contaminated with radioactive materials was disposed of down a well during the 1950's. It was closed and capped in the late 1950's. No information is available concerning the details of this well, including the depth. The nature of the wastes is hazardous and migration is possible. Therefore, this site requires rating. The final site rating score is 51.

Site No. 56: Septic tank system located west of the 318th FIS area. Little information is available concerning the uses of these septic tanks except that they are in the vicinity of an old nursery and that buildings in the vicinity are not used for industrial purposes. Herbicide and pesticide residues may have been disposed of here in the past and migration of these wastes is possible. Rating of this site is required. The final site rating score is 53.

Site No. 58: Leach pit (acid dry well) located on the east side of Hangar 2 used by the battery shop and perhaps other industrial shops. Activities that have occurred in Hangar 2 have been engine repair and painting, among others. The site requires rating. The final site rating score is 49.

Site No. 59: Spill area located in the vicinity of Building 675. A spill of 1,000 gallons of fuel oil in 48 hours was reported to have occurred at this site during the 1960's.

No further information regarding this spill site is available. The nature of the material spilled is hazardous and there is a potential for migration. Rating of this site is required. The final site rating score is 55.

c. Sites Not Rated

Site No. 3: Radioactive burial pit located in the demolition zone near the 800-area buildings. Low-level radioactive krypton tubes and instrument dials were buried here, probably in the mid- to late 1950's. Materials containing radium and strontium-90 may also have been buried here. These materials were reportedly sealed in concrete at the time of their burial. Surface monitoring for radioactivity measured only background levels. The characteristics of the suspected wastes are potentially hazardous; but there is only a low potential for migration, and only small quantities of wastes are believed buried here. Therefore, rating is not required for this site.

Site No. 8: Burial site located northeast of building 500. This site was in operation from 1960 until 1965. It was reported to have been used exclusively for the disposal of ash. Ash is not considered a hazardous material. Therefore, this site does not require rating.

Site No. 9: Burial site located under Building 537 in the civil engineering yard. Materials disposed of here are reported to be fire brick and hardwood flooring. These materials are not hazardous. Therefore, this site does not require rating.

Site No. 11: Landfill site located between the east taxiway and Clover Creek. The site (an area-type disposal site closed in about 1970) was used to bury demolition wastes,

construction debris, and other nonhazardous wastes. This site does not require rating.

Site No. 14: Burial area located on the south end of the instrument runway. This site was used for a short time between 1972 and 1973 for disposal of construction wastes, demolition wastes, and small quantities of other nonhazardous wastes. This site does not require rating.

Site No. 15: Unauthorized surface dump located south of the instrument runway in the aircraft approach zone. This area was used by county residents and Ft. Lewis personnel from 1960 until 1969 and McChord AFB from 1970 until 1972. Reports indicate that the majority of wastes disposed of were domestic wastes. Small quantities of oil may have been disposed of here; however, it is not expected that large quantities of any hazardous wastes were buried. The site does not require rating.

Site No. 16: Miscellaneous equipment burial site located north of Building 1146 and east of the railroad tracks. Reports indicate that this area was a vehicle salvage yard that was buried in the mid-1940's. Automotive equipment and parts for P-38, P-47, and P-51 aircraft were reported to have been buried here. This site is not expected to contain significant quantities of hazardous wastes. Therefore, the site does not require rating.

Site No. 17: Burial site located west of Building 1120. This site was reported to have been a motor pool area in 1951. It was a small operation; and when the building was demolished in the early 1950's, it contained only small quantities of industrial wastes in the resulting demolition debris. This site is not expected to contain significant

quantities of hazardous wastes. Therefore, the site does not require rating.

Site No. 18: Burial site located near Building 1171. One report indicated that this was a caustic soda pit used until the mid-1970's. The caustic soda presents little potential for contamination. The site does not require rating.

Site No. 19: Burial site located on the north end of the instrument runway. Reports indicated the site was small and filled with incidental domestic and demolition wastes. It was used from 1952 until it was covered in 1965. The characteristics of the wastes buried here are not hazardous. Rating is not required for the site.

Site No. 20: Burial site located on the north end of the instrument runway. Materials disposed of in this site were reported to be incidental domestic and demolition wastes. The characteristics of the wastes are not hazardous. Rating is not required for this site.

Site No. 21: Burial site located on the east side of the instrument runway south of Clover Creek. Materials that were reported to be disposed of here consisted of construction and demolition wastes. The characteristics of the wastes are not hazardous. Rating is not required for this site.

Site No. 23: Landfill site located south of the instrument runway in the aircraft approach zone. This was an area-type landfill in which construction and demolition wastes were reported disposed. Dates of operation for this site were unavailable. The characteristics of the wastes are not hazardous. Rating is not required for this site.

Site No. 24: Disposal site located south of the instrument runway. This site was used from 1957 until 1960 to dispose of flight line sweepings. The characteristics of these wastes are not hazardous. Rating is not required for this site.

Site No. 25: Disposal site located west northwest of Building 342. This site was used from the 1950's until 1970 to dispose of flight line sweepings. The characteristics of these wastes are not hazardous. Rating is not required for this site.

Site No. 26: Disposal site near the 800 ammunition storage area next to the 4th fairway of the golf course. This area and the surrounding demolition area were used primarily for ordnance disposal. This area was active from 1943 until 1954. In addition, the site was used for disposal of stumps and grass until the early 1960's. In 1972 the area was surface cleaned and some fragmentation bombs were located. Approximately 500 live grenades reportedly buried in this site area have not been found. Several burn kettles are located in this area, which were probably fueled by kerosene. The burn kettles were used until 1956 for ordnance deactivation. The residue from them was scattered throughout the area. The wastes in site No. 26 and those scattered throughout the surrounding area are hazardous; however, there is very little potential for migration. Rating is not required for this site.

Site No. 29: Crash fire training area located east of the perimeter road on the east side of the instrument runway. Base maps listed this area as a fire training site; however, the fire department had no knowledge of this site, and no activity was reported in this area during the interviews.

Probably this area was misidentified on the maps. Therefore, rating is not required.

Site No. 43: Liquid waste disposal site located west of the 350 ammo area buildings. An unsubstantiated report indicated that this area used to be a waste POL disposal site. A visual inspection did not reveal any environmental stress or lead to any other indication that this site had been active. It was probably a small disposal site, and therefore the potential for migration of potentially hazardous wastes is limited. Rating is not required for this site.

Site No. 45: Fuel spill site located behind Hangars 1 and 2. A 2,000-gallon AVGAS spill from the old Aqua System occurred here sometime during the 1950's. The spill was contained on the pavement behind the hangars and washed away. Therefore, the risk of groundwater contamination from infiltration is minimal. The nature of the spilled fuels is hazardous; but since the event does not involve a source of continuing environmental degradation, further rating of this site is not required.

V. CONCLUSIONS

V. CONCLUSIONS

A. Information obtained through interviews with past and present base personnel, base records, outside organizations, and field observations indicates that hazardous wastes have been disposed on McChord AFB property in the past. Measured concentrations of TCE, 1, 2 (trans) dichloroethylene, and other volatile organic compounds in groundwater samples obtained from wells on base and generally downgradient from McChord AFB provide <u>indirect</u> evidence that the airbase is a potential source of groundwater contamination.

B. Industrial waste disposal practices including recharge to the groundwater, discharge to surface drains and Clover Creek, burning in trenches and pits, and burial landfills may have provided potential sources of groundwater contamination.

C. Permeable surficial soils and underlying outwash deposits are in sufficient hydraulic connection to allow significant migration of hazardous contaminants to on- and off-base perched and regional groundwater aquifers.

D. High net annual infiltration of 19 to 23 inches of precipitation provides a significant driving force through the permeable surface soils to continue groundwater contamination after disposal practices have ended.

E. Clover Creek may have been a source of groundwater contamination in the past because of the industrial wastes discharged directly to the creek and the considerable amounts of creek water losses to groundwater above Steilacoom Lake.

F. The sanitary sewer system downstream of industrial facilities may be a source of contamination because significant quantites of industrial wastes have been discharged to the sanitary sewer in the past and there is potential for exfiltration from these lines.

G. Table 7 presents a priority listing of the rated sites considered to provide the greatest potential for ground-water contamination. These sites are shown grouped together in their respective geographical areas in Figure 18. These geographical areas allow for more efficient Phase II investigations rather than investigating each site separately.

H. EOD practices in the vicinity of Areas A and D (see Figure 18) pose a hazard to monitoring activities.

I. The remaining rated and unrated sites are not considered to present significant environmental concerns.

Table 7
PRIORITY LISTING OF DISPOSAL SITES
McCHORD AFB

Site Number	Description	Overall Score
Area A		
1	Burial Pit	62
2	Base Landfill	74
34	POL Disposal	62
46	Fuel Spill	65
Area B		
38	POL Spill/Disposal	65
40	POL Disposal	59
41	Fuel Spill	70
47	Fuel Spill	66
52	POL Spill	58
53	Drainage Ditch	65
55	POL Spill/Disposal	65
Area C		
37	POL Spill/Disposal	65
42	Fuel Spill	58
54	Leach Pit	80
57	Leach Pit	65
60	Leach Pit	65
61	Leach Pit	59
62	Leaching Area	70
Area D		
5 & 39	Base Landfill/Burning Trench	72
6	Base Landfill	64
7	Base Landfill	66
Area E		
10	Base Landfill	57
49	POL Spill	64
50	Fuel Spill	70
51	Fuel Spill	70
Area F		
30	Fire Training	72
31	Fire Training	72
Area G		
44	Leach Pit/POL Spill	63
Area H		
27	Fire Training	64
Area I		
13	Base Landfill	62
22	POL Spill/Disposal	57
Area J		
36	Leach Pit	58
48	PCP Tank Spill	62

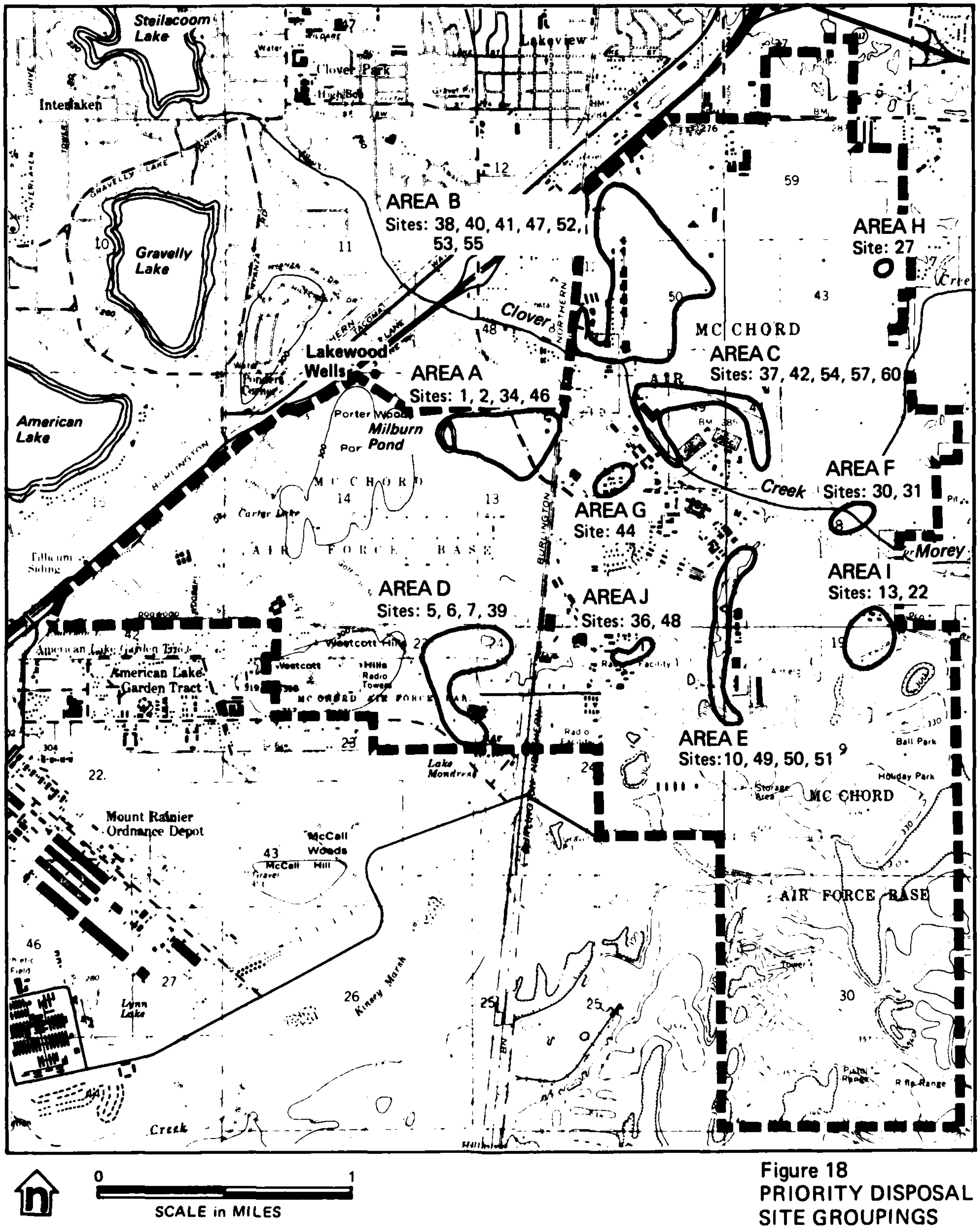


Figure 18
PRIORITY DISPOSAL
SITE GROUPINGS
MC CHORD AFB

VI. RECOMMENDATIONS

VI. RECOMMENDATIONS

A. A major environmental monitoring program (Phase II of the Installation Restoration Program) should be implemented to determine the extent and degree of groundwater contamination at McChord AFB. The priority for monitoring at McChord AFB is considered high.

B. Tables 8 and 9 present a summary of recommended monitoring sites, parameters to be measured, and the rationale for selecting the parameters. The approximate locations for the various elements of the monitoring program are shown in Figure 19. The various elements of the monitoring program are directed toward ten separate geographical areas (see Figure 18 in Section V).

C. For Area A (Milburn Pond and tank farm), six monitoring wells should be installed along the base perimeter and two background monitoring wells should be installed to the southeast of Area A. If glacial till is present, the wells should be multi-zoned (capable of providing samples at discrete levels) to allow sampling of both perched and regional groundwater. Well depths of 100 to 200 feet can be anticipated. In addition, one of the downgradient wells should extend into the next deeper water-bearing unit (200 to 400 feet) to monitor for deep contaminant migration from the entire base. It is anticipated that samples should be collected at the bottom of each zone. However, an OVA should be used to guide the placement of the well screen and therefore the sampling zone. It should be noted that the tank farm background well will also serve as a downgradient monitoring well for Areas C and G. Several of the wells may be able to be installed in

Table 8
RECOMMENDED MONITORING PROGRAM
MCCHORD AFB

Sample Type/Location	Monitoring Wells/Sediment Samples		Soil Boring Sampling Sites	Geophysical Investigation Sites	Specific Parameters					Indicator Parameters		
	Downgradient	Background			Volatile Organic Compounds	Phenols	Lead	Copper, Chromium, Cadmium, Zinc	Pesticides, Pentachlorophenol	TOC	pH	Specific Conductance
Monitoring Wells												
Area A	6[a]	2	NA	NA	X	X	X	X	--	X	X	X
Area B	4[a]	1	NA	NA	X	X	X	--	--	X	X	X
Area C	3[a]	1	NA	NA	X	X	X	X	--	X	X	X
Area D[b]	3	1	NA	NA	X	X	X	X	--	X	X	X
Area E	5	2	NA	NA	X	X	X	--	--	X	X	X
Area F	2	1[a]	NA	NA	X	X	X	--	--	X	X	X
Area G	1	--	NA	NA	X	X	X	--	--	X	X	X
Area H	1	1	NA	NA	X	X	X	--	--	X	X	X
Area I	2	1[a]	NA	NA	X	X	X	--	X[c]	X	X	X
Area J	1	--	NA	NA	X	X	X	--	X	X	X	X
Soil Boring Sampling												
Area A	NA	NA	1	NA	X	--	X	--	--	X	--	--
Area C	NA	NA	3	NA	X	--	X	X	--	X	--	--
Area E	NA	NA	3	NA	X	--	X	--	--	X	--	--
Area H	NA	NA	1	NA	X	--	X	--	--	X	--	--
Area J	NA	NA	1	NA	--	--	--	--	X[d]	--	--	--
Geophysical Investigations												
Area A	NA	NA	NA	2	--	--	--	--	--	--	--	--
Area C	NA	NA	NA	1	--	--	--	--	--	--	--	--
Sediment Samples												
Clover Creek	3	1	NA	NA	X	X	X	X	--	--	--	--

Note: NA - Not Applicable.

[a]One monitoring/background well to be completed to a deeper and potentially a third level.

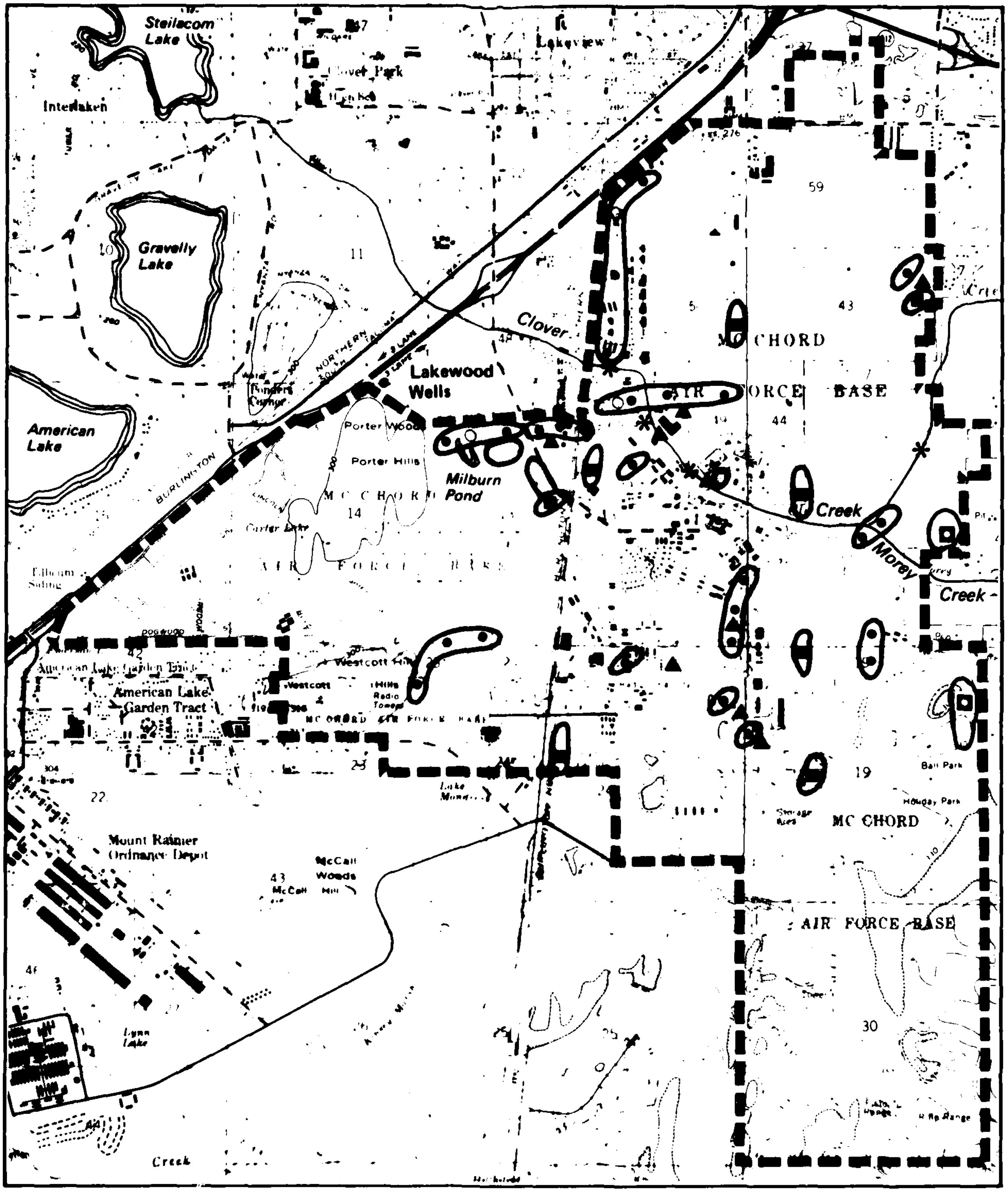
[b]Unexploded ordnance disposal sites potentially located in this area.

[c]Includes only pesticides and performed only if Area J monitoring wells installed.

[d]Does not include pesticides.

Table 9
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Volatile Organic Compounds	Organic solvents and possible decomposition products. Includes TCE, PCE, chloroform, methylene chloride, 1,1,1 trichloroethane, and 1, 2 (trans) dichloroethylene.
Phenols	Phenolic cleaner and paint stripper used in the past
Lead	Leaded fuel spills and disposal used in the past and found in contaminated soils
Cadmium, Copper, Chromium, Zinc	Plating operation identified as potential source and found in contaminate soils
Pentachlorophenol	Wood preserving tank identified as potential source
Pesticides (including DDT and 2,4-D)	Used on base in the past and handled in the CE yard.
Total Organic Carbon	Fuels and solvents spills and disposal (indicator parameter)
pH	Indicator parameter
Specific Conductance	Indicator parameter



0 1
SCALE in MILES

General Area for Location of Monitoring Well

Down-Gradient Monitoring Well Location (preliminary)

Background Monitoring Well Location (preliminary)

Deeper Zone Monitoring Well Location (preliminary)

Soil Boring Sampling Location (preliminary)

Geophysical Investigation Search Area (preliminary)

Sediment Samples Location (preliminary)

Combination of Background and Deeper Zone Monitoring Well

Figure 19
PRELIMINARY RECOMMENDED MONITORING PROGRAM
MC CHORD AFB

conjunction with EPA's Lakewood wells investigation. Samples should be collected a minimum of two times and analyzed for volatile organic components (including TCE, tetrachloroethylene, and 1, 2 (trans) dichloroethylene), lead, cadmium, phenols, and indicator of contamination (TOC, pH, and specific conductance). Soil boring samples should be taken at the tank farm leach pit. The boring should extend to the water table (20 feet) and 4 to 5 samples analyzed for volatile organic compounds, TOC, and lead. In addition, a magnetometer survey should be conducted in the areas shown to determine the location of the approximately 100 buried barrels. If the barrels can be located and their presence confirmed with ground penetrating radar, at least one barrel should be excavated and its contents analyzed.

D. For Area B (C Ramp), four downgradient and one background multi-zone monitoring well should be installed similar to those in Area A above. One of the wells should be extended to the next deeper water-bearing unit (200 to 400 feet) for basewide groundwater monitoring. The frequency and analytical parameters for monitoring should be the same as Area A above, except that cadmium can be omitted. Downgradient wells for Area C will provide background water quality data for this area.

E. For Area C (D Ramp, wash rack, engine test cells, Building 745, and Hangars 1-4), three downgradient and one background multi-zone monitoring well will be installed similar to those in Area A. One of the wells should be extended to the next deeper water-bearing unit (200 to 400 feet) for basewide groundwater monitoring. The monitoring frequency and analytical

parameters should be the same as Area A. In addition, one soil boring each should be made in both of the leach pits at the wash rack in the Hangar 1 dry well and in the Building 745 leach pit. Four soil borings should be made in the plating sludge disposal site. The borings should extend to the water table (10 to 20 feet) and 3 to 4 soil samples be collected at each location and analyzed for volatile organic compounds, phenols, lead, cadmium, zinc, and TOC. RCRA EP analyses should also be conducted on representative samples containing high heavy metals to evaluate the leachability of the metals. This will determine if these are potentially a continuing source of contamination. In addition, ground penetrating radar should be used to confirm or deny the presence of the 50,000-gallon tank near Hangar 1.

F. For Area D (golf course and SAGE landfills and burning trench), three downgradient and one background multi-zone monitoring wells should be installed. Installation should be similar to those in Area A. No monitoring of deeper water-bearing units is needed in this area. The frequency and analytical parameters should be the same as for Area A above.

G. For Area E (318th area), five downgradient and two background multi-zone monitoring wells should be installed in a manner similar to those in Area A. The monitoring frequency and analytical parameters will be the same as Area A, except that cadmium can be omitted. In addition, soil borings should be made at the AGE leach pit, the surface drainage ditch northwest of Building 343, and defueling leach depression. The borings should extend to the water table (20 to 40 feet) and the 4 to 5 soil samples collected at each

location analyzed for volatile organic compounds, lead, and TOC. The northerly of the two background wells will serve as a downgradient well for Area I.

H. For Area F (fire training), two downgradient and one background multi-zoned monitoring wells should be installed in a manner similar to Area A. The background multi-zoned well should be extended to a deeper level (200 to 400 feet) for basewide background monitoring. The monitoring frequency and analytical parameters will be the same as for Area A, except that copper, chromium, cadmium, and pesticides should be included for the background well. Pesticides will need to be included only if Area J monitoring program is implemented. No soil boring samples will be taken here because the exact locations of the sites have not been determined. However, if groundwater contamination is discovered, additional soil testing should be considered to determine if contamination is continuing.

I. For Area G (motor pool), one downgradient multi-zone monitoring well should be installed similar to those in Area A. The monitoring frequency and analytical parameters will be the same as Area A, except that cadmium can be omitted.

J. For Area H (fire training), one downgradient and one background multi-zoned monitoring well should be installed in a manner similar to Area A. The monitoring frequency and analytical parameters will be the same as for Area A, except that cadmium can be omitted. In addition, one soil boring should be made through the training area. The boring, including sampling and analysis, will be similar to those in Area E.

K. For Area I (landfill and old motor pool), two downgradient and one background multi-zoned monitoring well should be installed in a manner similar to Area F. The monitoring frequency and analytical parameters will also be the same as for Area F.

L. For Area J (Civil Engineering yard), one downgradient multi-zone monitoring well should be installed in a manner similar to Area A. The monitoring frequency and analytical parameters will be the same as Area A, except that cadmium can be omitted and pentachlorophenol (PCP) and pesticides (2, 4-D and DDT) added. In addition, one soil boring should be made beneath the old wood preservative tank. The boring will be similar to those in Area E, except that the samples will be analyzed only for PCP.

M. Because of past industrial waste discharges to Clover Creek and the potential for periodic Clover Creek recharge to the groundwater, four sediment samples (one background) will be collected from the creek and analyzed for volatile organic compounds, phenol, cadmium, zinc, and lead.

N. Though all the sites are potentially significant sources of contamination, they can be grouped in the following priorities:

- Group I (first priority) - Areas A, B, C, D, E, and F

- Group II (second priority) - Areas G, H, and I

- Group III (third priority) - Area J and Clover Creek sediment sampling

O. In addition to other issues referred to earlier, the base environmental monitoring program should implement a program of sanitary sewer testing for infiltration and exfiltration in areas serving industrial shops. The recommended monitoring program is extensive enough to detect contamination coming from most of the likely areas. These data would then be useful in identifying additional sources of contamination. Also, if the 50,000-gallon tank near Hangar 1 is discovered, the base should be responsible for smoke testing for possible outlets.

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Appendix A
RESUMES OF TEAM MEMBERS

STEVEN R. HOFFMAN

Education

B.S., Civil Engineering, South Dakota School of Mines and Technology, 1971

Experience

Mr. Hoffman is a civil and sanitary engineer who is currently serving as a project manager and project technical consultant on a variety of solid and hazardous waste management projects for CH2M HILL. Examples of his project experience are:

- Project technical consultant on various aspects of municipal, industrial, and hazardous solid waste collection and disposal. Projects include collection system analysis; waste characterization and reduction; municipal solid waste landfill site selection, design, and gas recovery; and landfill disposal of hazardous and industrial sludges throughout the U.S.A.
- Project manager for a hazardous waste disposal study for an ARCO oil refinery in Washington, including waste extraction analysis, groundwater and unsaturate zone monitoring, and waste migration analysis.
- Project manager for assistance with compliance to RCRA regulations for a Gulf Oil refinery in Texas, including waste characterization, preparation of interim status plans, implementation of monitoring programs, and assistance in permit preparation.
- Assistant project manager for hazardous materials disposal site record searches for two U.S. Air Force bases to assess potential for waste migration from present and past practices and to recommend followup actions.
- Assistant project manager responsible for sanitary landfill design and preparation of operations plan and contract bid documents for a municipal solid waste landfill in Portland, Oregon.
- Project manager in developing a disposal system for and analyzing the impacts of a new land disposal technique for an industrial/hazardous sludge containing a high concentration of heavy metals, for the Monsanto Corporation, Seattle, Washington.
- Project manager for ITT Rayonier pulp and paper mill sludge disposal landfills in Grays Harbor and Clallam Counties, Washington, including site feasibility studies, final designs, and operational plans.

STEVEN R. HOFFMAN

- Assistant project manager for a resource recovery feasibility study and solid waste management plan for Snohomish County, Washington. The project includes alternative technology analysis, economic feasibility analysis, marketing studies, and management strategies.

- Project engineer for the Solid Waste Management Study for King County, Washington. Mr. Hoffman's responsibilities included assessing the environmental impacts of solid waste handling facilities and performing conceptual designs and costing for transfer stations, shredding and baling facilities, ocean disposal, resource recovery process systems, rail haul facilities, energy recovery systems, and sanitary landfills.

- Project manager for developing a solid waste management plan for Trinity County, California, with major emphasis on transfer, transport, sanitary landfill, and management options.

- Project manager and project engineer on a variety of water resources projects including flood studies, urban drainage and water quality studies, and environmental impact studies.

- Project engineer for developing a preliminary design for a solid waste transfer and refuse-derived fuel processing facility for the Metropolitan Service District, Portland, Oregon.

- Project engineer for preliminary and final design of a shredfill processing facility for Cowlitz County, Washington, which consisted of shredding, magnetic separation, leachate collection, treatment, and disposal.

- Project engineer for a pyrolysis and energy recovery feasibility study and a phased sanitary landfill design for Grays Harbor County, Washington. The design included a rural collection/transfer system to transport wastes to the landfill site.

Prior to joining CH2M HILL, Mr. Hoffman was a pollution control engineer with the Environmental Protection Agency where he conducted site investigations and wrote pollution control standards for South Dakota.

Professional Registration

Washington

Membership in Organizations

American Society of Civil Engineers

■ MICHAEL C. KEMP

Education

M.S., Civil and Environmental Engineering, Utah State University, 1978
B.S., Civil Engineering (environmental emphasis), Tennessee Technological University, 1976

Experience

Since joining CH2M HILL in June of 1978, Mr. Kemp has participated in a variety of projects. His major project experience includes:

- On-site inspection, operations and maintenance manual preparation, and construction services for the expansion of a potato processing wastewater treatment plant in Quincy, Washington.
- Preparation of operating and closure plans for RCRA hazardous waste disposal requirements for Gulf Oil Company, Port Arthur, Texas.
- Preliminary study of sanitary landfill leachate treatment alternatives for Portland Metro.
- Feasibility of land application of pulp mill wastewaters for Australia Pulp Manufacturers, Melbourne
- Review of sampling, analysis, and treatability alternatives used in the EPA Aluminum Forming Development Document for the Aluminum Manufacturers Association.
- Miscellaneous coal fines dewatering facility design and hydraulic analyses for the Washington Irrigation and Development Company.
- Miscellaneous facility design and preparation of the operations and maintenance manual for the ITT Rayonier pulp mill wastewater treatment plant in Port Angeles, Washington.

Before joining CH2M HILL Mr. Kemp served 2 years as a laboratory research assistant at the Utah Water Research Laboratory where he conducted a wide variety of chemical and biological water quality analyses and operated a pilot scale overland flow tertiary treatment system. Mr. Kemp's other experience includes 6 months as a surveyor with the National Park Service and 1 year as an engineering assistant in a construction administration office of the Atomic Energy Commission.

Technical Certification

Engineer-In-Training, Tennessee
Class II Wastewater Treatment Plant Operator, Washington

MICHAEL C. KEMP

Membership in Organizations

American Society of Civil Engineers
Chi Epsilon
Pacific Northwest Water Pollution Control Association
Water Pollution Control Federation

Publications

Kemp, M.C., D.S. Filip, and D.B. George, 1978. Evaluation and Comparison of Overland Flow and Slow Rate Systems to Upgrade Secondary Wastewater Lagoon Effluent, Utah Water Research Laboratory, Logan, 70 pages.

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■ **SCOTT W. DETHLOFF**
Environmental Engineer

Education

M.S., Civil Engineering (environmental emphasis), Texas A&M University, 1981.
B.S., Civil Engineering, Texas A&M University, 1979.

Experience

Since joining CH2M HILL in September of 1981, Mr. Dethloff has participated in several projects. His experience includes:

- Design engineer for a sulfur dioxide control system at Wausau Paper Mills Co., Brokaw, Wisconsin. Work included design, hydraulics, piping layout, and an operations manual.
- Design engineer for a wastewater treatment and neutralization system for Fairchild Camera & Instrument Corporation, Puyallup, Washington.
- Project engineer for Phase I of the U.S. Air Force Installation Restoration Program at McCord Air Force Base, Washington. Project involved a records review and site investigation to assess the potential for ground-water and surface water contamination resulting from the past hazardous waste disposal practices.

Before joining CH2M HILL, Mr. Dethloff served 2 years as a laboratory research and teaching assistant at Texas A&M University where he conducted a variety of chemical and biological water quality analyses. Also while at Texas A&M University, Mr. Dethloff worked at the Texas A&M University Wastewater Treatment Plant as a laboratory water quality analyst. His term there lasted approximately one and one-half years. His duties included plant operation as well as basic water quality sampling and analysis. Mr. Dethloff's other experience includes 2 summers as a teaching assistant on a student warehouse design and 3 months as a surveyor for Warren and Sons Co., Corpus Christi, Texas.

Technical Certification

Engineer-In-Training, Texas

Membership In Organizations

American Society of Civil Engineers
Chi Epsilon Honor Society
Phi Kappa Phi Honor Society

JEFFERY H. RANDALL
Ground-Water Hydrologist

Education

Ph.D. Candidate, University of Arizona, 1982
M.S., Hydrology, University of Arizona, 1974
B.S., Geology, Indiana University, 1971

Experience

Mr. Randall has been responsible for the organization, supervision, and data analysis of numerous ground-water engineering and hydrology projects for municipal, agricultural, industrial, and mining clients. Studies have included ground-water resource evaluations, aquifer test analyses, production and dewatering well and well field designs, ground-water quality and monitoring studies, seepage analyses, and environmental impact assessments. He is also the firm's senior ground-water modeler.

Before joining CH2M HILL in 1978, Mr. Randall was in charge of projects studying the ground- and surface-water quantity and quality and computer modeling of two basins in southern Arizona for the Arizona Water Resources Research Center. He also developed and applied hydrologic tracing technology using trace volatile organics in ground- and surface-water systems, as a Graduate Associate in Research with the Department of Hydrology and Water Resources, University of Arizona.

Recent projects Mr. Randall has worked on include:

- Hydrogeologic investigation, test-well design, drilling management, aquifer pumping tests, and production well field design for a 13,000-gpm alluvial aquifer ground-water supply for the Grant County PUD fish hatchery at Priest Rapids Dam, Washington

- Well design, specifications, and pumping tests and analysis of high-capacity wells for municipal well field developments for the City of Umatilla, and Rockwood and Parkrose Water Districts, Oregon, and the City of Quincy, Washington

- Regional hydrogeologic investigation and well rehabilitation, including acidization and deepening, drilling management, and aquifer pumping tests and analysis for U.S. Gypsum in Pilot Rock, Oregon

- Hydrogeologic site investigation, including location and design of 14 monitoring wells, drilling management, and data analysis to quantify impacts of disposal practices on ground-water quality for Atlantic Richfield Company, Cherry Point, Washington

- Ground-water impact assessment of the proposed Northern Tier Pipeline, including the quality effects of ground-water and oil mixtures for the Washington Energy Facility Site Evaluation Council
- Hydrogeologic landfill site evaluations, ground-water monitoring network design, and data analysis of the St. Johns Landfill, Durham, S.E. 106th and Division, and Wildwood sites for Metropolitan Services District (METRO), Portland, Oregon
- Regional ground-water quality modeling for Livermore-Amador Valley Water Management Agency, Pleasanton, California
- Hydrogeologic site evaluation and water quality analysis of existing ground-water conditions to evaluate impacts of municipal effluent enhancement of marsh habitat in the Carson Valley for Incline Village, Nevada
- Ground-water quality impacts assessment and saturated and unsaturated zone monitoring network designs for forest-land sludge application projects for the City of Bremerton, Washington, and Seattle Metro
- Hydrogeological assessment and ground-water monitoring network design for the City of Spokane North and South landfills
- Baseline ground-water assessments, including quantity and quality for Noranda Mining Company, General Crude Oil Company, and Utah International Incorporated in California and Oregon

Membership in Organizations

American Geophysical Union
National Water Well Association

Publications

"Hydrogeology and Water Resources of Kirkland Creek, Yavapi County, Arizona," M.S. thesis, University of Arizona, 1974.

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JANE DYKZEUL GENDRON
Biologist

Education

B.A., Biology (emphasis on Marine Biology) San Francisco State University 1976

Experience

Ms. Gendron is a general biologist in the environmental sciences department of CH2M HILL. Her experience consists of studies in freshwater and marine biology and ecology, water quality sampling and analysis, and terrestrial ecology. She has participated in the assessment of the ecological impacts of many industrial and municipal developments.

Ms. Gendron's experience includes the following:

- Washington State Department of Ecology. Field data collection, laboratory water quality analysis, sanitary surveying, and report preparation for the bacteriological study of Willapa Bay.

- U.S. Air Force, West Coast bases. Assessed the potential for migration of hazardous material through natural systems at several west coast Air Force bases during Phase 1 of the Air Force Installation Restoration Program.

- Pacific Gas Transmission, San Francisco, California. Aquatic biology task leader in the selection of a natural gas pipeline corridor route in Wyoming, Utah, Nevada, and California.

- Metropolitan Service District, Portland, Oregon. Prepared preliminary site descriptions and identified sensitive species and systems occurring at or near several proposed sanitary landfill sites.

- Ventura Regional County Sanitation District, Oxnard, California. Field data collection, laboratory analysis, and report preparation for application for waiver of secondary sewage treatment requirements.

Before joining CH2M HILL, Ms. Gendron worked for the University of Southern California's Catalina Marine Science Center, where she designed and directed a reconnaissance survey of the terrestrial and marine ecosystems along 26 miles of coastland and was involved in an ecological assessment of impacts of the City of Avalon's marine sewage outfall.

Membership in Professional Organizations

American Fisheries Society
American Institute of Biological Sciences
Western Society of Naturalists

Publications (Authored as Jane E. Dykzeul)

"Reconnaissance Survey—Santa Catalina Island; Area of Special Biological Significance—Subarea 1." State of California Department of Fish and Game. Report to California State Water Quality Control Board. May 1978. 130 pp.

Appendix B
OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

U.S. GOVERNMENT

U.S. Environmental Protection Agency, Region X		
Water Quality Section	visit	Bill Mullen
Solid/Hazardous Waste Section	visit	John Barrich
	visit	Doug Smith
	visit	Fred Wolffe
U.S. Fish and Wildlife Service		
Fishery Management Program	206/753-9460	John Meyers
Endangered Species Team	Letter Sent	James Buttorff
U.S. Geological Survey Water Resources Division Tacoma, Washington	206/593-6510	Information Service

STATE OF WASHINGTON

Department of Agriculture	206/753-5062	Art Loci
Department of Ecology	206/753-2353	Will Abercrombe
	206/753-0135	Jim Oberlander
	206/459-6114	Ken Slattery
	206/753-2353	Mr. Tracy
	206/459-6501	Tom Cook
Department of Emergency Services	206/753-5255	Gordon Goth
Department of Social and Health Services	206/464-7671	Bob James
	206/753-5987	John Littler
Department of Fisheries		
Toxicological Labs	206/543-4583	Greg Burgman
Habitat Management	206/753-6650	Earl Finn
Department of Game		
South Tacoma Hatchery	206/964-7267	Art Westrope
Upland Game Program	206/588-3731	Bud Angerman
Fisheries Management	206/753-5713	Jim Gearheard
Non-Game Program	206/753-5700	Kelly McAllister
Washington Natural Heritage Foundation	letter	Elise Augenstein

PIERCE COUNTY

Pierce County Division of Emergency Services	206/593-4797	Merl Sterling

Pierce County Health Department	206/593-4750	Derek Sandison
Pierce County Planning Department	206/593-4570	Don Cagle

CITY OF TACOMA

Department of Public Utilities Water Division	206/593-8214	Dennis Ellison
Tacoma Planning Department	206/591-5363	Pete ?

OTHER

Lakewood Water District	206/588-4423	Wayne Dunbar

Appendix C
INSTALLATION HISTORY

Appendix C
INSTALLATION HISTORY

BASE HISTORY

During the 1930's, the area to be later occupied by McChord AFB was a small airport operating biplanes on a dirt strip. At the time, it was known as either Tacoma Field or Old Tacoma Airport. The base was formally dedicated on 5 May 1938. Available facilities at this time consisted of one hangar and two landing strips.

Major construction at McChord AFB occurred during the period from 1938 to 1941. During this time, a 2-mile section of Clover Creek was rechanneled to conflict less with airfield operations, and construction of two runways and four hangars was completed. Additional construction included the station hospital, the radio transmitter building, the Air Corps barracks, the photo laboratory, an administration building, three warehouses, a maintenance building, six residential buildings, and the coal-fired central heating plant.

On 3 July 1940, McChord Field was formally dedicated. At this time McChord served principally as a bomber base. The 17th Bombardment Group and the 89th Reconnaissance Squadron were among the first flying units assigned. These early units flew B-18 and B-23 aircraft.

Following the Japanese attack on Pearl Harbor on 7 December 1941, McChord rapidly became the country's largest bomber training base. The enlisted strength jumped from 4,000 to 7,000 men and the officer strength increased to 400. B-25 bombers were added to the inventory and the site became a modification center for P-39 aircraft. Modification of

P-39's was stopped in September of 1944. After this, McChord switched to modifications of the P-38, B-24, and B-25 aircraft.

In 1947, the Army Air Forces (previously the Army Air Corps) became the U.S. Air Force. On 1 January 1948, McChord Field was redesignated McChord Air Force Base. The base then served as an Air Force processing station for the states of Washington, Idaho, Montana, and Oregon.

The current host unit at McChord, the 62nd MAW, was assigned (in 1947). Initially, it was known as the 62nd Transport Group. In August 1947, it was renamed the 62nd Troop Carrier Wing.

In 1950, the base became part of the Air Defense Command's 25th Air Division and assumed the air defense of the Northwestern United States. Shortly before the outbreak of hostilities in Korea, additional fighter units were ordered to the Pacific Northwest to guard the air approaches to the Hanford, Washington, atomic works and other vital defense plants. The F-86 and F-94 jet fighters were stationed at McChord at this time. Later in the 1950's significant traffic in both men and supplies passed through McChord in support of the United Nations operations in Korea.

A second phase of major construction was begun in the 1950's, primarily to accommodate improved weapons systems; build fighter operational facilities, including a complete tracking system; lengthen the runway to 8,100 feet; and replace or upgrade World War II temporary facilities. In 1960, the runway was lengthened to its current 10,100 feet.

In the 1960's, the nation's involvement in Vietnam again mobilized the base's airlift and defensive forces. The base

became a major gateway to Southeast Asia, with deployment of thousands of Army troops from adjacent Ft. Lewis.

In 1968, the 62nd Military Airlift Wing took over command of McChord from the 25th Air Defense Command, and the base became part of the worldwide operation for the Military Airlift Command (MAC).

McChord marked its third period of major construction in the 1970's. Construction included improved navigational equipment, conversion of the central heating plant from coal to natural gas, and erection of numerous facilities such as a passenger terminal, commissary, base exchange, noncommissioned officers' club, and modular dormitories. Other building projects included a bowling alley, youth center, reserve operations building, canine facilities, and gate houses.

Other squadrons currently operating at McChord, under the command of the 62nd Military Airlift Wing, are the 4th Military Airlift Squadron, the 8th Military Airlift Squadron, the 36th Tactical Airlift Squadron, the 62nd Aerial Port Squadron, and several support squadrons including transportation, supply, maintenance, and safety. Also operating out of McChord are the 446th Military Airlift Wing and the 318th Fighter Interceptor Squadron. McChord continues as home of the 25th NORAD Region and the 25th Air Defense Squadron.

Aircraft presently at McChord include the C-130 Hercules and the C-141 Starlifter (assigned to the 62nd MAW) and the F-106 supersonic interceptor (assigned to the 318th FIS). The 318th FIS also conducts pilot training using the T-33 jet aircraft.

PRIMARY MISSION

62nd Military Airlift Wing (MAW): To command and control those MAW forces that are provided for airlift of troops, equipment, passengers, and mail during peacetime or wartime from areas requiring such airlift. To participate, when directed, in airborne assault operations involving the delivery of troops, equipment, and supplies. To conduct peacetime operations that will maintain a high state of readiness training. To be responsible for the overall supervision of Air Force Reserve advisory units which may be assigned. To provide for safety, morale, discipline, and welfare of assigned personnel. To exercise command jurisdiction over McChord Air Force Base. To be prepared to perform command/control mission and essential wartime functions of headquarters, 22nd Air Force.

TENANT MISSION

25th NORAD Region: To defend the Pacific Northwest, including British Columbia and western Alberta, Canada, against air attack through the means of a network of radar sites.

318th Fighter Interceptor Squadron: To intercept, identify, and destroy enemy aircraft and airborne missiles penetrating the assigned area of responsibility and to conduct training necessary to ensure the efficient accomplishment of the task.

446th Military Airlift Wing (Associate): To provide command and staff supervision along with certain support functions for assigned units during peacetime. The associate wing also provides necessary augmentation to the 62nd MAW in the form of aircrews, maintenance, and aerial port operations to achieve full use of military airlift aircraft under

conditions of heightened tension up to and including full mobilization.

1905th Communications Squadron: To provide communications (i.e., radio, telephone, telecommunications center, navigational aids, and base switchboard) and air traffic control for the 62nd MAW and all tenant units, including transient units through McChord.

Det 11, 17th Weather Squadron: To provide environmental services and support to all units at or transient through McChord AFB (excluding 25th NORAD Region).

Det 11, 1369th Photographic Squadron: To provide still photographic support and audiovisual library services to the 62nd MAW and tenant units located at or receiving support from McChord AFB.

Field Training Detachment 502, ATC: To provide job-oriented system, associate and aircrew familiarization training on specific weapons systems, and associate aerospace ground equipment.

52nd, 53rd, and 86th Aerial Port Squadrons (AFRES): To operate fixed air terminal facilities as required, to support operations, and to manage commercial transportation services.

Appendix D

STORAGE TANKS

APPENDIX D
STORAGE TANKS AT McCHORD AFB

Table D-1
MISCELLANEOUS STORAGE TANKS

Location	Use	Capacity
Storage tanks (near Bldg 745, underground)	Diesel MOGAS	25,000 gal. 12,000 gal.
Storage tank (near Bldg 704, underground	AvLube	20,000 gal.
Storage tanks (storage area A, above ground, main tank farm)		
A_1	JP-4	210,000 gal.
A_2	JP-4	840,000 gal.
A_5	JP-4	525,000 gal.
A_7	JP-4	630,000 gal.
Transfer tanks (underground)	JP-4	12,000 gal. (3 ea)
Storage tanks (storage area B, underground)	JP-4	50,000 gal. (4 ea)
Storage tanks (storage area C, underground)	JP-4	50,000 gal. (8 ea)
Defueling	JP-4	12,000 gal. (2 ea)
Storage tanks (storage area D, underground)	JP-4	50,000 gal. (4 ea)
Defueling	JP-4	12,000 gal.
Storage tanks (storage area J, underground)	JP-4	50,000 gal. (6 ea)
Drain tank	JP-4	2,000 gal.
Storage tanks (1200 area underground)	MOGAS	5,000 gal.
Storage tanks (Bldg 720, underground)	MOGAS	8,000 gal. (2 ea)
Storage tanks (Bldg 760, underground)	MOGAS	10,000 gal. (2 ea)

Location	Use	Capacity
Storage tanks (Bldg 582, underground)	MOGAS	10,000 gal. (4 each)
Storage tank (Bldg 1422, underground)	MOGAS	3,000 gal.
Storage tanks (Bldg 301, underground)	MOGAS	1,000 gal. 2,000 gal.
Storage tank (Bldg 533, underground)	MOGAS	500 gal.
Waste oil tank (Bldg 730)		10,000 gal.
Storage tank (near Bldg 704)	Alcohol	20,000 gal.
Bldg 532	Insecticides Fungicides	326 gal. 30 lb.
Bldg 580	Herbicides	375 gal.
Bldg 739	Sulfuric Acid Battery Acid	4 gal. 80 gal.
Bldg 576	Grease	1,525 gal.
Bldg 503	Powdered Soap Liquid Soap Detergent	400 lb. 30 gal. 120 gal.
Bldg 724A	Wood Preservative Lubricating Oil Paint Remover	55 gal. 55-gal.drum 55 gal.
Bldgs 721, 778, 779, and 718	Lubricating Grease Lubricating Oil	25 lb. each 55-gal. drum eac
Building 777	Lubricating Grease Contaminated Fuel Oil Sludge Lubricating Oil	25 lb. 1,000 gal. 55-gal. drum
Bldg 724	Sulfuric Acid Lubricating Grease Lubricating Oil	35 gal. 25 lb. 55-gal. drum

Location	Use	Capacity
Bldg 720	Ethylene Glycol	1,430 gal.
Between 777 and 762	Waste Oil	200 gal.
Bldg. 1119	Sulfuric Acid	5 gal.
Hangar 1	Grease	175 lb.
	Trichloroethylene	55 gal.
Bldg 1219	Soap	100 lb.
Bldg 1215	Liquid Oxygen	400 gal.
	Gaseous Oxygen	6,000 cf
Bldg 1173	Engine Oil	320 gal.
	Hydraulic Fluid	100 gal.
Hangar 2	Lacquer Thinner	105 gal.
	Methyl Ethyl Ketone	55 gal.
	Poly Thinner	30 gal.
	Toluene	30 gal.
	Grease	175 lb.
	Poly Paint	315 gal.
	Poly Stripper	25 gal.
	Enamel Stripper	30 gal.
	Hydraulic Fluid	30 gal.
	Carbon Remover	15 gal.
	Trichloroethylene	75 gal.
	Cleaning Solvent	310 gal.
	Waste Hydraulic Oil and Solvent	300 gal.
Bldg 1179	Methyl Ethyl Ketone	55 gal.
	Dry Cleaning Solvent	55 gal.
	Motor Oil	55 gal.
	Cleaning Compound	55 gal.
	JP-4	350 gal.
	Waste Oil and Solvents	50 gal.
Bldg 745	Solvent 15-661	[illegible] gal.
	Engine Oil	4[illegible] gal.
	Alkaline Soap	[illegible]
	Soap	[illegible]
	Paint Thinner	[illegible] gal.
	Naphtha	[illegible] gal.
	Fiberglass Resin	[illegible] gal.

Location	Use	Capacity
ARV and W&T Shop	Cleaning Solvent	400 gal.
	Stripping Compound	275 gal.
Hangar 4	Trichloroethylene	80 gal.
Bldg 1169	JP-4	5,000 gal.
	Diesel Fuel	5,000 gal.
	MOGAS	5,000 gal.
	Cleaning Compound	55 gal.
	Cleaning Solvent	110 gal.
	Lubricating Oil	275 gal.
	Technical Ether	8 gal.
	Gun Grease	75 lb.

TABLE D-2
No. 2 HEATING OIL TANKS

Location (bldg. no.)	Capacity (gal.)
106	300
106	840
108	840
132	1,000
186	840
187	300
187	840
189	300
190	300
192	300
221	1,765
223	500
224	500
227	550
250	550
290	550
305	1,000
307	2,000-3,000
341	220
342	1,765
350	500
351	4,000
400	675
420	675
430	500
500	650
501	550
501	840
502	650
503	1,500
504	840
505	840
506	1,000
507	1,765
508	500
519	1,000
522	500
524	1,000
525	840
526	300
526	550
527	2,000
528	300
529	300
532	200-300
533	500
535	550

TABLE D-2 (continued)

Location (bldg. no.)	Capacity (gal.)
536	840
540	110
540	2,500
543	5,000
545	1,800
557	550
558	550
559	550
560	1,500
575	300
576	140
576	4,000
577	10,000
600	1,000
601	1,000
602	1,000
603	600
609	300
609	675
611	300
612	675
675	1,000
700	3,000
713	300
718	500
718	1,000
719	1,000
721	550
722	675
724	2,000
727	550
730	8,000
734	378,000
736	10,000
739	550
747	500
748	500
749	300
749	500
760	650
769	675
773	500
777	840
779	1,000
789	300
792	500
801	2,500
830	1,000
833	1,000

TABLE D-2 (continued)

Location (bldg. no.)	Capacity (gal.)
836	1,765
841	1,000
853	30,000
886	1,500
1104	1,000
1106	675
1109	550
1110	240
1121	1,500
1128	500
1172	300
1172	1,500
1189	500
1189	550
1204	550
1205	1,500
1207	2,000
1218	1,000
1304	550
1305	2,000
1307	2,000
1308	550
1321	500
1322	500
1323	500
1403	300
1403	675
1417	550
1422	8,000
1425	1,000
1426	300
1501	300

TABLE D-3
ON-BASE HOUSING UNITS[a]
HEATING OIL TANKS

Location (bldg. no.)	Capacity (gal.)
605	600
606	300
607	300
608	300
614	300
615	300
616	300
617	300
618	300
619	300
625	300
626	300
627	300
628	300
629	300
630	300
631	300
632	300
633	300
634	300
635	300
636	300
637	300
638	300
639	300
640	300
641	300
642	300
643	300
644	300
645	300
646	300
647	300
648	300
649	300
650	300
651	300
652	300
653	300
654	300
655	300
656	300
657	300
658	300
659	300
660	300

TABLE D-3 (continued)

Location (bldg. no.)	Capacity (gal.)
661	300
662	300
663	300
664	300

[a] 600 housing area; 50 units; 15,300 gallons capacity.

TABLE D-4
OFF-BASE HOUSING UNITS[a]
HEATING OIL TANKS

Location (bldg. no.)	Capacity (gal.)
3000	500
3001	500
3004	500
3005	500
3008	500
3009	500
3012	500
3013	300
3015	300
3016	500
3017	300
3019	300
3020	300
3021	300
3022	300
3023	300
3032	1,500
3050	500
3051	500
3054	500
3055	500
3058	500
3059	500
3062	500
3063	500
3066	500
3067	500
3070	500
3074	500
3075	500
3078	500
3079	500
3082	500
3086	500
3100	500
3101	500
3104	500
3105	500
3108	500
3109	500
3112	500
3113	500
3116	500
3117	500
3120	500
3121	500

[a]Heartwood Housing; 59 units plus 2 miscellaneous; 29,950 gallons capacity.

TABLE D-4 (continued)
Off-Base Housing Units (Cont.)

Location	Capacity (gal)
3150	500
3151	500
3154	500
3155	500
3159	500
3163	500
3200	500
3203	500
3204	500
3207	500
3208	500
3211	500
3212	500
3216	500
3408	550

Appendix E

ABANDONED POL TANKS

Appendix E
ABANDONED POL TANKS
MCCHORD AFB

Facility	Use	Capacity (gal.)	Present Status
AQUA System (near Bldg. 20)	AVGAS	25,000 (12 ea.)	All tanks filled with sand.

Appendix F

BELT SKIMMERS AND GRAVITY OIL/WATER SEPARATORS

Appendix F

BELT SKIMMERS AND GRAVITY OIL/WATER SEPARATORS

MCCHORD AFB

Facility	Discharge	Location
Belt Skimmer 1	Storm drain	Near Bldg. 1204
Belt Skimmer 2	Storm drain	Near Bldg. 1178
Belt Skimmer 3	Storm drain	Between Bldg. 745 and Hangar 1
Belt Skimmer 4	Sanitary sewer	D Ramp Washrack
Belt Skimmer 5	Storm drain	Near Bldg. 23
Belt Skimmer 6	Storm drain	Near Fire Station
Belt Skimmer 7	Storm drain	South of Fire Station near Clover Creek
Belt Skimmer 8	Storm drain	Near motor pool, Bldg. 713
Oil/Water Separator	Storm drain	Motor pool near Bldg. 714
Oil/Water Separator	Storm drain	Bldg. 792
Oil/Water Separator	Leach pit	Tank farm
Oil/Water Separator	Storm drain	Near Bldg. 1175
Oil/Water Separator	Leach pit	Near Bldg 342
Oil/Water Separator	Sanitary sewer	Fire Training
Oil/Water Separator	Storm drain	Bldg. 765
Oil/Water Separator	Storm drain	Hangar 4
Oil/Water Separator	Storm drain	Bldg. 1121
Oil/Water Separator	Storm drain	Near Hangar 5
Oil/Water Separator (2)	Storm drain	Bldg. 1170
Oil/Water Separator (2)	Storm drain	Bldg. 745
Oil/Water Separator (2	Storm drain	Bldg. 1165
Oil/Water Separator (2)	Storm drain	Bldg. 1164
Oil/Water Separator (2)	Storm drain	Bldg. 1169
Oil/Water Separator (2)	Storm drain	Bldg. 1167
Oil/Water Separator (2)	Storm drain	Bldg. 1166
Oil/Water Separator	Storm drain	Bldg. 328
Oil/Water Separator	Storm drain	Fire Station

Appendix G

HAZARD ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided in Figure 2 and the rating factor guidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste managment practices category factor to the sum of the scores for the other three categories.

FIGURE 1

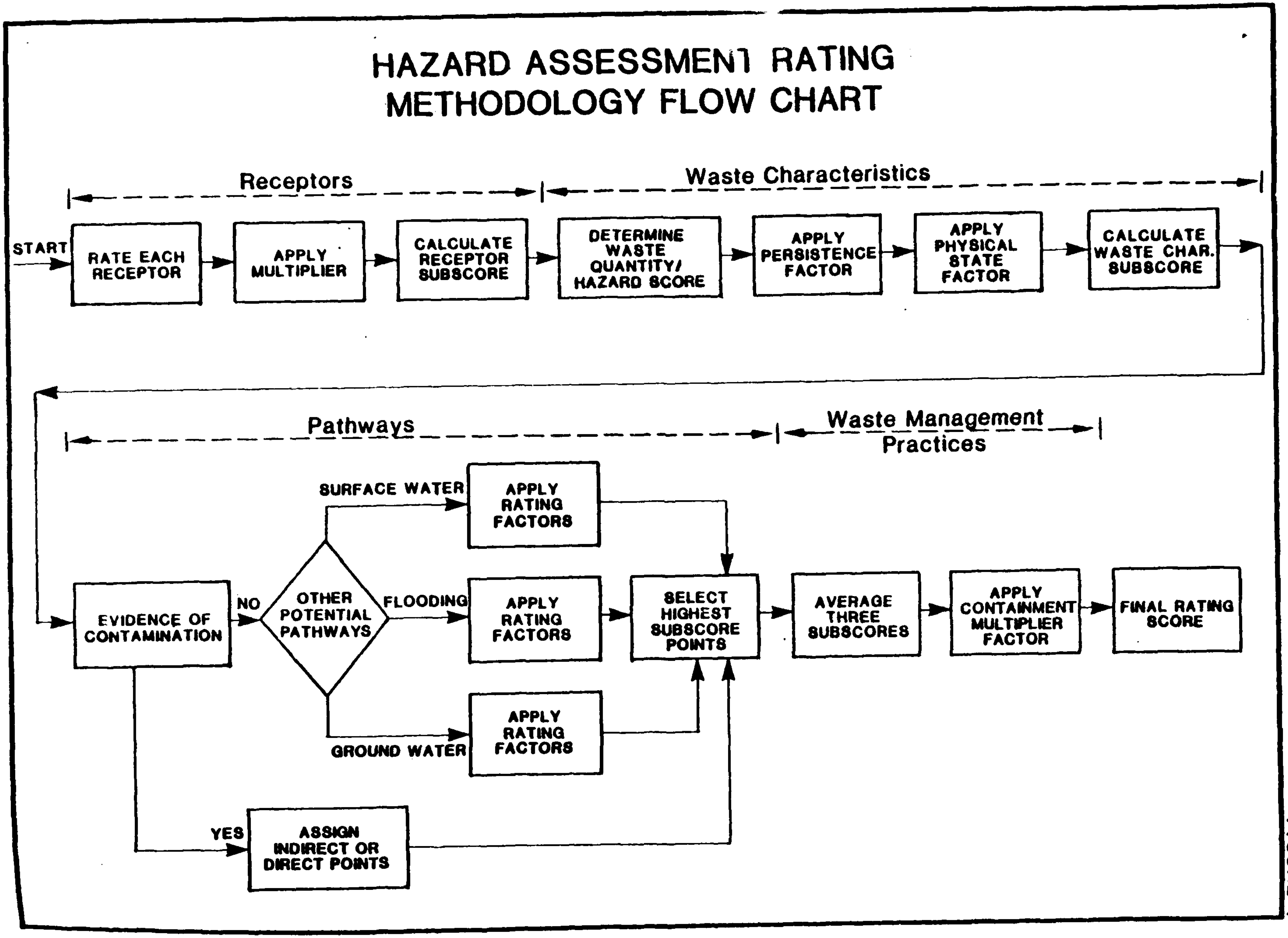
HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
YES
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________

LOCATION ______________________

DATE OF OPERATION OR OCCURRENCE ______________________

OWNER/OPERATOR ______________________

COMMENTS/DESCRIPTION ______________________

SITE RATED BY ______________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		12
B. Distance to nearest well		10		30
C. Land use/zoning within 1 mile radius		3		9
D. Distance to reservation boundary		6		18
E. Critical environments within 1 mile radius of site		10		30
F. Water quality of nearest surface water body		6		18
G. Ground water use of uppermost aquifer		9		27
H. Population served by surface water supply within 3 miles downstream of site		6		18
I. Population served by ground-water supply within 3 miles of site		6		18
		Subtotals	____	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C = confirmed, S = suspected) ____
3. Hazard rating (H = high, M = medium, L = low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
D. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

	Rating Scale Levels			
Hazard Category	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABL (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

AD-A123 311 INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR MCCHORD AIR FORCE BASE WASHINGTON(U) CH2M HILL GAINESVILLE FL AUG 82 F08637-80-G-0010

3/3

UNCLASSIFIED F/G 13/2 NL

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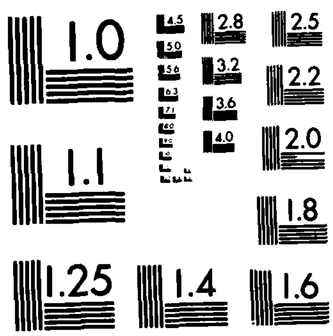
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

Appendix H
SITE RATING FORMS

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 1, Burial Pit

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1945- 1956

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Ash, tree stumps, demolition, 100 barrels

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	1	8	8	24
		Subtotals	36	108

Subscore (100 X factor score subtotal/maximum score subtotal) 33

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 70
Waste Characteristics 40
Pathways 75

Total 185 divided by 3 = 62
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

62 x 1.0 = 62

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 2, Milburn Pond Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1939- 1975

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Demolition, ash, industrial & limited residential, 100 barrels

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

70 x 1.0 = 70

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to ground water		8		
Subtotals				

Subscore (100 x factor score subtotal/maximum score subtotal) NA

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	70
Pathways	80

Total 222 divided by 3 = 74 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

74 x 1.0 = 74

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 4 Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1940's, 1958-1978

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Residential, industrial

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by *surface* water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	150	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x .9 = 36

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

36 x 1.0 = 36

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 90 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration – site is a low point, NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	36
Pathways	67
Total 175 divided by 3 =	58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 5 Base Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1951-1967

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Open burning landfill w/ waste oil & fuel burning pits

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	42	108

Subscore (100 X factor score subtotal/maximum score subtotal) 39

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	72
Pathways	75
Total 216 divided by 3 =	72 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 x 1.0 = $\boxed{72}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

Page 1 of 2

NAME OF SITE No. 6, SAGE LANDFILL
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE 1961- current
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Demolition with limited industrial & domestic
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.9 = 36

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

36 x 1.0 = 36

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		4
		Subtotals		2

Subscore (100 X factor score subtotal/maximum score subtotal)

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
		Subtotals	76	90

Subscore (100 x factor score subtotal/maximum score subtotal) 84

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 84

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	36
Pathways	84
Total 192 divided by 3 =	64 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

64 x 1.0 = $\boxed{64}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 7 Base Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1954 - 1966

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Open burning landfill

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.9 = 54

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
Subtotals			68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	54
Pathways	75

Total 198 divided by 3 = 66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 1.0 = $\boxed{66}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 10, Demolition Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1954-1966

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Demolition landfill with limited industrial & domestic

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.9 = 36

C Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

36 x 1.0 = 36

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	36
Pathways	67
Total 172 divided by 3 =	57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 1.0 = $\boxed{57}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 12, Base Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1939-1952

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Domestic, industrial, demolition

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
Subtotals			60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	32
Pathways	67

Total 168 divided by 3 = 56 Gross Total Score

B Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 1.0 = $\boxed{56}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 13, Base Landfill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1950- current

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Domestic, industrial, and demolition

SITE RATED BY S.R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 0.75 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
		Subtotals	76	90

Subscore (100 x factor score subtotal/maximum score subtotal) 84

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 84

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	30
Pathways	84
Total 186 divided by 3 =	62 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

62 x 1.0 = $\boxed{62}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 22, Vehicle Maintenance Site
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE 1939-1951
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Waste POL
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	40
Pathways	58

Total 170 divided by 3 = 57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 1.0 = $\boxed{57}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 27, Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1960 - 1976

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION JP-4 & AVGAS (contaminated)

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	70
Waste Characteristics	64
Pathways	58

Total 192 divided by 3 = 64 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

64 x 1.0 = 64

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 28, Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1962 - 1964

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Helicopter Fire Training - contaminated fuel

SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	70
Waste Characteristics	40
Pathways	58
Total 168 divided by 3 =	56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 1.0 = 56

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 30, Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1955-1960

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL and fuel

SITE RATED BY SRHoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	1	1	1	3

Subscore (100 x factor score/3) 33

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	70
Waste Characteristics	72
Pathways	75
Total 217 divided by 3 =	72
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 x 1.0 = $\boxed{72}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 31 Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1950-1955

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL and contaminated fuel

SITE RATED BY S.L. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	1	1	1	3

Subscore (100 x factor score/3) 33

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
Subtotals			68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	70
Waste Characteristics	72
Pathways	75

Total 217 divided by 3 = 72 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

72 x 1.0 = 72

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 32, Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1976 – current

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Contaminated JP-4

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	126	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	28	90

Subscore (100 x factor score subtotal/maximum score subtotal) 31

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 31

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 70
Waste Characteristics 40
Pathways 31
Total [illegible] divided by 3 = 47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

[illegible] = 9

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 33, Fire Training Area

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE late 1940's - 1950

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Contaminated or clean fuel

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			36	90

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 40

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	48
Pathways	40

Total 57 divided by 3 = 52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

_____ x 1.0 = 52

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 34 Tank Farm Disposal & Spill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1956- current

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Fuel tank sludge, JP-4, and leaded fuel

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) AVGAS spill L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

70 x 0.8 = 56

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

56 x 1.0 = 56

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	56
Pathways	58
Total 186 divided by 3 =	62 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

62 x 1.0 = 62

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE NO. 35, Radioactive Disposal Well

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1950's

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Low-level liquid radioactive wastes

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 1.0 = 30

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

30 x 1.0 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	48	90

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	30
Pathways	53
Total 152 divided by 3 =	51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = $\boxed{51}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 36, Storm Water Leach Pit

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1940's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Storm runoff and limited POL, solvents, paint

SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	50	90

Subscore (100 x factor score subtotal/maximum score subtotal) 56

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 69
Waste Characteristics 48
Pathways 56

Total 173 divided by 3 = 58
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 37 & 38, "C" and "D" Ramp Miscellaneous Dumping/Spills
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE 1940's – 1960's
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Waste POL disposal & fuel spills
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	1	8	8	24
Direct access to ground water		8		
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	64
Pathways	58

Total 194 divided by 3 = 65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = 65

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 40, POL Disposal
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE 1951 to early 1960's
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Waste POL used for grass control
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	48
Pathways	58
Total 178 divided by 3 =	59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 x 1.0 = $\boxed{59}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 41, AVGAS Leak

LOCATION McChord AFB, C Ramp

DATE OF OPERATION OR OCCURRENCE 1965

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION AVGAS

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	80
Pathways	58
Total 210 divided by 3 =	70
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x 1.0 = $\boxed{70}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 42, Refueling Dock

LOCATION McChord AFB, D RAMP

DATE OF OPERATION OR OCCURRENCE 1940's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Defueling spills and POL disposal

SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	48
Pathways	58

Total 175 divided by 3 = 58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = $\boxed{58}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 44 Vehicle Maintenance

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1940's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL spills and leach pit/dry well

SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	44	90

Subscore (100 x factor score subtotal/maximum score subtotal) 49

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ____

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 69
Waste Characteristics 72
Pathways 49
Total 190 divided by 3 = 63 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

63 x 1.0 = $\boxed{63}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 46, Railroad Yard Spill

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE Late 1960's

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION JP-4 spill

SITE RATED BY S. R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	64
Pathways	58
Total 194 divided by 3 =	65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = 65

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 47, Fuel Leak

LOCATION McChord AFB, C Ramp

DATE OF OPERATION OR OCCURRENCE unknown

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION 25000g of unknown fuel

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	72
Pathways	58
Total 199 divided by 3 =	66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 1.0 = $\boxed{66}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 48 PCP Tank
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE 1950's to present
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Pentachloro phenol tank
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	–	–
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	60
Pathways	58
Total 187 divided by 3 =	62 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

62 x 1.0 = 62

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 49, AGE leach pit

LOCATION McChord AFB; 318th Area

DATE OF OPERATION OR OCCURRENCE 1978 to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL, Solvents, JP-4

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Oils MCH (0.8) = 64
JP-4 LCM (0.8) = 64
TCE SCH (1.0) = 60

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	64
Pathways	58
Total 191 divided by 3 =	64
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

64 x 1.0 = 64

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 50, Defueling Spills

LOCATION McChord AFB, 318th Area

DATE OF OPERATION OR OCCURRENCE unknown

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION JP-4 spillage to natural leaching depression

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 76

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 69
Waste Characteristics 64
Pathways 76

Total 209 divided by 3 = 70 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x 1.0 = $\boxed{70}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 51, Storm Drainage System

LOCATION McChord AFB, 318th Area

DATE OF OPERATION OR OCCURRENCE 1950's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL, solvents, JP-4

SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) Oil M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 76

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	64
Pathways	76
Total 209 divided by 3 =	70 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x 1.0 = 70

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 52, POL spillage

LOCATION McChord AFB, Bldg 1173

DATE OF OPERATION OR OCCURRENCE Unknown

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL spillage

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	—	24
Direct access to ground water	NA	8	—	—
		Subtotals	52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	48
Pathways	58
Total 175 divided by 3 =	58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = $\boxed{58}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 53, Storm Drainage Ditch

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE Since early 1970's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL discharge

SITE RATED BY SRHoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	[illegible]	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	130	180

Receptors subscore [illegible] subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score [illegible] the degree of hazard, and the confidence level of the information.

1. Waste quantity [illegible] 5
2. Confidence level [illegible] C
3. Hazard rating (H = high, M = [illegible] H

Fact[illegible] (factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence [illegible]

[illegible] .8 = 48

C. Apply physical state [illegible]

Subscore B X physical [illegible] characteristics subscore

[illegible] 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	NA	8	—	—
		Subtotals	68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 76

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ____

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	48
Pathways	76

Total 196 divided by 3 = 65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = 65

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 54, Wash Rack / Industrial Waste Leach Pit

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1940's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION All possible industrial wastes

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) PD 680, TCE, Oil, Paint stripper L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 X 0.9 = 90

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

90 X 1.0 = 90

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to ground water		8		
Subtotals				

Subscore (100 x factor score subtotal/maximum score subtotal) NA

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 69
Waste Characteristics 90
Pathways 80

Total 239 divided by 3 = 80 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

80 x 1.0 = 80

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 55 Industrial Waste Spills
LOCATION McChord AFB, Crimp nosedocks
DATE OF OPERATION OR OCCURRENCE early 1950's to present
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Fuel, waste POL, and solvent spills
SITE RATED BY S R Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			130	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 72

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) Waste Oil M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	18	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			54	90

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ____

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	72
Waste Characteristics	64
Pathways	60
Total 196 divided by 3 =	65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = $\boxed{65}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 56, Septic Tanks

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1950's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Herbicides/ Pesticides

SITE RATED BY

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

4 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect ev.dence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			44	90

Subscore (100 x factor score subtotal/maximum score subtotal) 49

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 49

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	40
Pathways	49
Total 158 divided by 3 =	53 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

53 x 1.0 = $\boxed{53}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 57, Industrial Waste Leach Pit

LOCATION McChord AFB, Hanger 1

DATE OF OPERATION OR OCCURRENCE At least from early 1960's to early 1970's

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION NDI & Prop Shop Wastes

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
		Subtotals		108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
		Subtotals	60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	60
Pathways	67
Total 196 divided by 3 =	65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = $\boxed{65}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 58 Industrial Waste Leach Pit

LOCATION McChord AFB, Hangar No. 2

DATE OF OPERATION OR OCCURRENCE as early as 1940's through late 1960's

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Battery Acid Dry Well

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground-water migration

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			52	90

Subscore (100 x factor score subtotal/maximum score subtotal) 58

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 58

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	20
Pathways	58

Total 147 divided by 3 = 49 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

49 x 1.0 = 49

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 59, Fuel Oil Spill

LOCATION McChord AFB, Bldg 675

DATE OF OPERATION OR OCCURRENCE 1960's

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION 1000 gallon leak

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108
Subscore (100 X factor score subtotal/maximum score subtotal)				NA
2. Flooding		1		
Subscore (100 x factor score/3)				NA
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			44	90
Subscore (100 x factor score subtotal/maximum score subtotal)				49

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 49

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	48
Pathways	49
Total 166 divided by 3 =	55 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

55 x 1.0 = $\boxed{55}$

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 60, Industrial Leach Pit & Infiltration Ditch

LOCATION McChord AFB, Jet Engine Test Cells

DATE OF OPERATION OR OCCURRENCE Late 1950's to present

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Waste POL, solvent, fuel

SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore NA

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1 Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) NA

3 Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	—	—
Subtotals			60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 69
Waste Characteristics 60
Pathways 67
Total 196 divided by 3 = 65
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = 65

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 61 Leach Pit

LOCATION McChord AFB

DATE OF OPERATION OR OCCURRENCE 1953-1960

OWNER/OPERATOR McChord AFB

COMMENTS/DESCRIPTION Acid dry well from plating operation

SITE RATED BY SR Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) Lead, Cadmium in solution S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) NA

2. Flooding

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) NA

3. Ground water migration

Rating Factor	Factor Rating	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	NA	8	—	—
Subtotals			60	90

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	40
Pathways	67

Total 176 divided by 3 = 59
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 X 1.0 = 59

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 62 Leaching Area
LOCATION McChord AFB
DATE OF OPERATION OR OCCURRENCE unknown
OWNER/OPERATOR McChord AFB
COMMENTS/DESCRIPTION Plating tank waste dumping area
SITE RATED BY S.R. Hoffman

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	1	6	6	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	124	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 69

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 0.75 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Samples from VC Pipe outlet

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		24
Net precipitation		6		18
Surface erosion		8		24
Surface permeability		6		18
Rainfall intensity		8		24
Subtotals				108

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		24
Net precipitation		6		18
Soil permeability		8		24
Subsurface flows		8		24
Direct access to ground water		8		
Subtotals				

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	69
Waste Characteristics	60
Pathways	80
Total 209 divided by 3 =	70
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x 1.0 = $\boxed{70}$

Appendix I

FEDERAL AND STATE SPECIES DESIGNATIONS

Appendix I
STATUS CODES FOR SPECIAL ANIMALS

Code	Explanation
FE	Federal Endangered - A species in danger of extinction throughout all or a significant portion of its range.
FT	Federal Threatened - A species which is likely to become an endangered species within the foreseeable future.
FP	Proposed Federal Threatened or Endangered Species - Those species which have been proposed for listing with supporting data in the Federal Register and are therefore legally recognized under the Endangered Species Act.
FC1	Candidate species, Category 1 - Taxa for which the U.S. Fish and Wildlife Service presently has sufficient information to support the bilogical appropriateness of their being listed as Endangered or Threatened.
SE	State Endangered - A species which is seriously threatened with extirpation throughout all or a significant portion of its range within Washington.
SS	State Sensitive - A species that could become endangered within Washington in the foreseeable future without active management or removal of threats.

Code	Explanation
SC	State Concern - Species of concern because of uniqueness, rarity, scientific value, or vulnerability to human disturbance or land management, such as timber, range, or wildlife habitat management practices. Examples: effects of logging on cavity nesters, range reseeding on ground nesters, disturbance on waterbird colonies.
SU	State Status Unknown - Information is inadequate for evaluation of population status. A focus for future monitoring, inventory, or study.
PT	State Proposed Threatened. Any vascular plant taxon likely to become Endangered within the foreseeable future in Washington if factors contributing to its population decline or habitat degradation or loss continue.
PS	State Proposed Sensitive. Taxa with small populations, or localized distributions within the state that are not presently Endangered or Threatened, but whose populations and habitats will be jeopardized if current land use practices continue.

Appendix J
LIST OF MINOR INDUSTRIAL ACTIVITIES

Appendix J
LIST OF MINOR INDUSTRIAL ACTIVITIES

Name	Present Location and Dates (Bldg. No.)	Past Location and Dates (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment, Storage, or Disposal Method
62 FMS					
Machine Shop	745	-	X	X	Consumed in use; oil/water separator
Aero Repair	Hangar 2	-	X	X	Consumed in use; contract removal
Sheet Metal/Structural Repair	745 1972-Pres.	755 prior to 1972	X	X	Consumed in use; contract removal
62 CES					
Power Production	540	-	X		Consumed in use
Structural Repair	-	-	X		Consumed in use
Interior Electric	528	-	X	X	Consumed in use; DPDO
Exterior Electric	528	-	X	X	Consumed in use; DPDO
Heating Maintenance	540	-			
Plumbing	540	-			
DEMB Housing Maintenance	3408	-			
Welding/Sheet Metal/Machine	540	-	X	X	Consumed in use; contract removal
Liquid Fuels	540	-			
Carpentry	540	-			
Water and Waste	540	-	X		Consumed in use
Refrigeration	559	-	X		Consumed in use
Railroad Maintenance	707	-	X	X	Consumed in use; contract removal
318 FIS					
Egress	304	-	X	X	Consumed in use; empty cans to dumpster
Communication/Navigation	310	-	X		Consumed in use
Photo Lab	305	-	X		Consumed in use
AGE Dispatch	309	-			
Life Support	308	-			
EOD	551	-	X	X	Consumed in use; empty cans to dumpster
Welding	745	-			Consumed in use
Simulator Maintenance	305/306	-			
Mockup	-	-	X		Consumed in use
62 AMS					
Simulators	1305/1307	-	X		Consumed in use
Battery Shop	-	-	X		
62 ABG					
Samtu	1104	-	X	X	Contract disposal
Data Automation	552	-			
62 APS					
Passenger Service	1179	-			
Data Record Computer Room	1422	-			
Air Terminal Operations	1422	-			

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